DEC 9 - 1935

# ELECTRICAL WORLD

McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK CITY. 25 CENTS PER COPY

DECEMBER 7, 1935

Survey of Small Appliance Sales

Port Washington in Operation

High-Pressure Oil Cable

Carrier Current for Street Lights

Municipal Diesel Plant Costs

Burnham on Switchgear

# Better Protection—Greater Reliability

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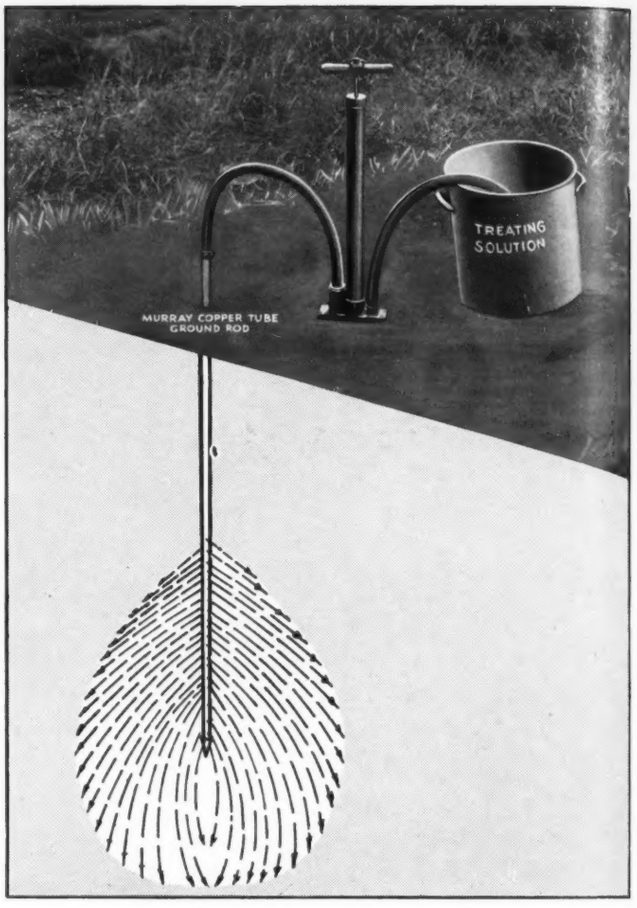


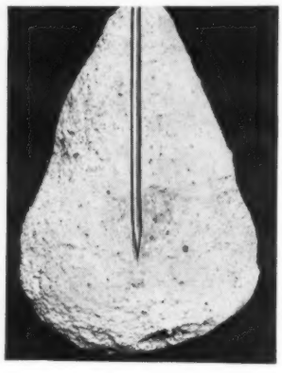

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# ELECTRICAL WORLD

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## Reader's Guide to This Issue

**This index is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.**

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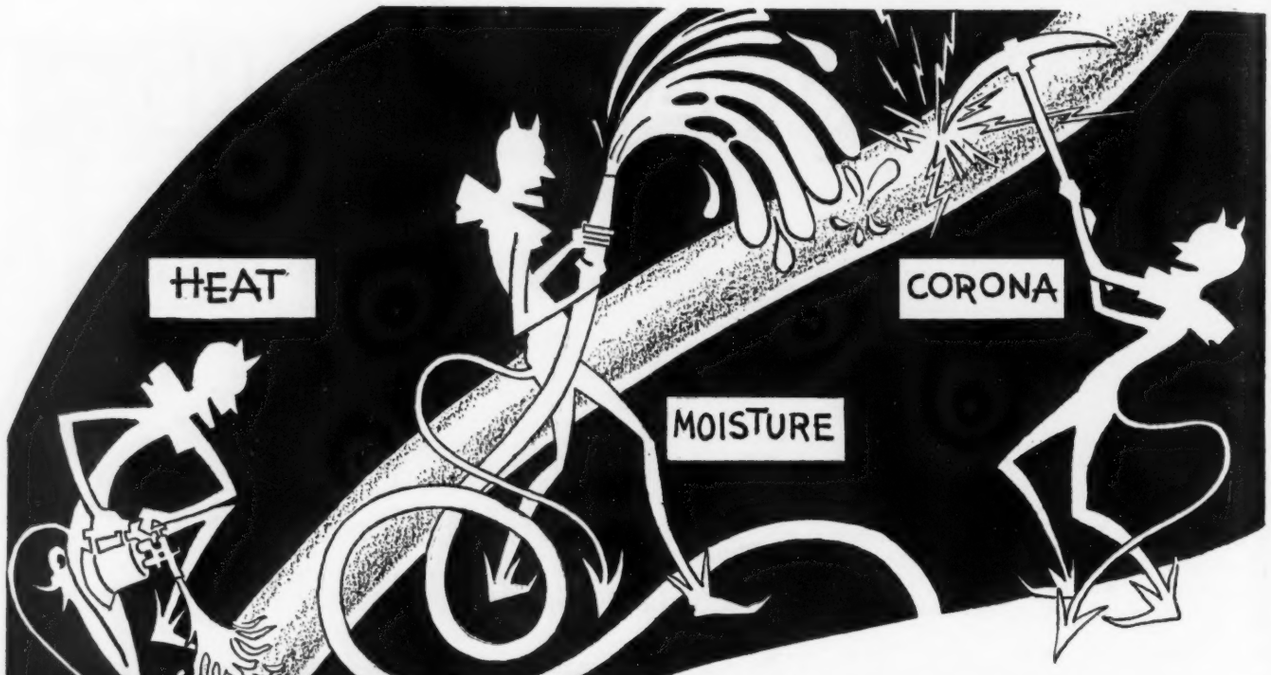


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# ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

*PUBLISHED EVERY OTHER SATURDAY*

DECEMBER 7, 1935


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## Courageous Action in New York

EFFECTIVE opposition to the establishment of a competing municipal plant can come from the business men in a community. A case in point is the La Guardia proposal for a New York municipal plant. Last week eight business organizations sponsored the organization of a Citizens' Committee of Five Hundred to oppose the proposal. No doubt these groups will be denounced as "tools of the power trust" by the Mayor, but the action taken shows that they have the courage to do their duty as citizens.

Too frequently a local private utility is left alone to oppose fallacious municipal plant proposals. Business men are slow to organize and slow to act, even though they pay the taxes. Even in New York the utility has carried on the fight alone for some months. It had both to protect itself and to expose the fallacies of the La Guardia proposal. The advent of this new committee at this time will permit the public to have the facts from a reputable group of citizens. This should prevent New York City from embarking on an unnecessary and costly venture in power generation.

•

## Conant Strong for Progress

PROGRESS comes from great intellectual adventurers, says President Conant of Harvard, and the worst possible evil to the human race would be for us to get so occupied with the idea of safety and security that we prevent these adventurers from acting. He refused to concede that shackling research and curbing invention pointed the way to better social conditions. He believes in progress, in intellectual freedom and in the ability of the race to use new technological treasures intelligently despite some admitted evils. The perspective of a college president of the caliber of Dr. Conant is needed in these times. Whether in industry, research, invention or literature, the progress of a nation is measured by the sum total contributions of its intellectual adventurers. They need freedom, not dictation from a planning bureau.

## Delay Will Handicap Recovery

IT IS to be hoped that the courts will act promptly on the holding company cases. This is in the public interest, for uncertainty holds up recovery action by one of the greatest industries in the country. Holding companies cannot make long-term commitments when faced with court cases in which decisions in favor of the government would necessitate a complete reorganization of their corporate structures and give bureaucratic management control in Washington. The situation, as so well pointed out by Mr. Fogarty, does not permit of delay. This destructive legislation prevents the utilities from having a "breathing spell" and from going forward with greatly needed expansion programs. If it is declared unconstitutional promptly the utilities will give an impetus to recovery exceeding that of any other industry.

•

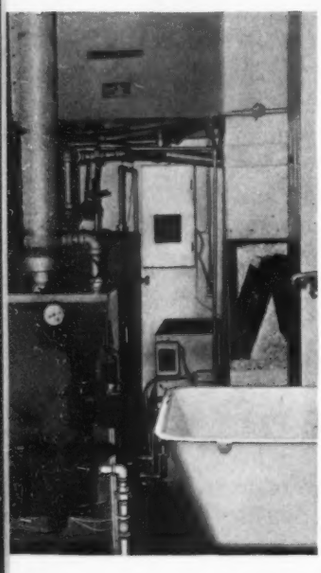
## Unemployment Has One Solution

A FRANK story by Mayor McNair of Pittsburgh in a current periodical relates his experiences under governmental endeavors to remove unemployment. It leads to one conclusion. The only solution to unemployment is reemployment through the revival of private enterprise and private initiative. The record is surely clear enough to indicate that the alphabetical agencies to create employment are more than failures; their whole tendency has been to stifle the revival of private enterprise because of the tax burdens they pile up, the waste of money in useless enterprises and the labor troubles they created. This entire New Deal experience shows the failure of any small group of men to have the wisdom to plan and direct the activities of the people of this country in their economic affairs. It is high time that the significance of the record of the government's attempts to create employment and direct the destinies of business be interpreted into political action that will renew and stimulate legitimate business and also restrict the government to functions that are constitutional.

# Built Around Electric Service

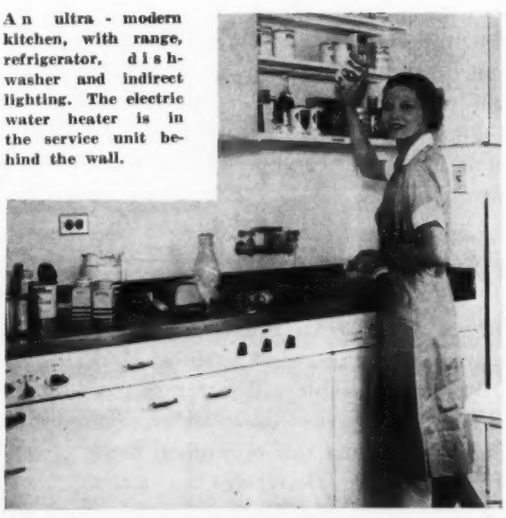
The bathroom has an electric heater beneath the basin for emergency use and indirect lighting on a three-panel mirror which backs against the service unit.

"The Motohome," a practical expression of the nation-wide movement to advance "the science of better living" inaugurated by Owen D. Young. One of three houses in White Plains, N. Y., prefabricated structures built around a central power unit which provides the heating, plumbing, air conditioning and all electrical service for the complete electric kitchen, radio, etc. These houses are factory built of steel-framed, pre-fitted, fire- and sound-proof sections, making insulated walls, floors and ceilings. More rooms or another story may be added.



Service compartment, nerve center of the Motohome. All electrical and mechanical equipment, wiring and piping for servicing the home come complete in this metal cabinet, no larger than an ordinary pantry.

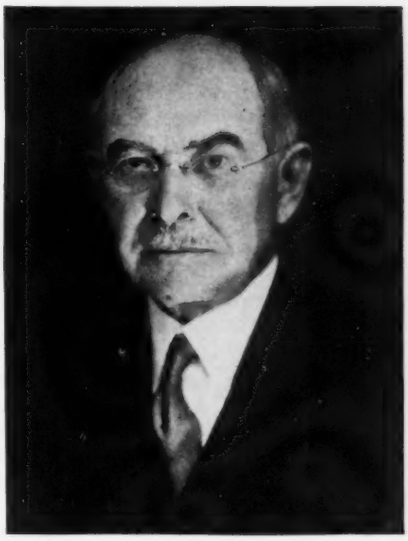
An ultra - modern kitchen, with range, refrigerator, dishwasher and indirect lighting. The electric water heater is in the service unit behind the wall.



The living room. Windows are assembled at corners to facilitate furniture arrangement, with interchangeable screens and storm sash. They open like auto windows to scoop in the breeze. Radio is built in.

Nursery walls are indestructible and soundproof. Air conditioning and many outlets provide for every electrical convenience that contributes to a child's health and happiness.

# Edwin Wilbur Rice, Jr.



**On November 25 Edwin Wilbur Rice, Jr., distinguished pioneer, executive, inventor and engineer, died at his home in Schenectady, at the age of seventy-three**

JUST 56 years ago Mr. Rice fell under the spell of the electrical industry and became assistant to Elihu Thomson in Philadelphia. With the American Electric Company, in New Britain, he learned the elements of manufacture, and in 1882, when this company was transferred to Lynn, he worked for three years with Mr. Thomson as experimenter and inventor on arc lighting systems. In 1885 C. A. Coffin of the Thomson-Houston Electric Company persuaded the 30-year-old Mr. Rice to accept the position as superintendent of the works. This was the start of his career and of the growth of the company. In 1885 the employees numbered a few hundred, but by 1892 there were 3,700 at work at Lynn. This was the year of consolidation of the Edison General Electric Companies and the Thomson-Houston into the General Electric Company, with Mr. Coffin as president and Mr. Rice as technical director.

In the General Electric Company Mr. Rice progressed steadily to the top. In 1896 he was made a vice-president and was the unanimous choice of the directors as the president when Mr. Coffin retired in 1913. In the great expansion years his guidance built the company and he was made honorary chairman of the board of directors in 1922.

In largest measure Mr. Rice had engineering and executive ability united with imagination and human understanding. He had faith in the future of the tungsten lamp and encouraged its development. He had a broad view of engineering needs and supported the research and development that made the polyphase motor and alternating-current system available. He was instrumental in developing the steam turbine. He was an advocate of railroad and marine electrification. His inventive ability is shown in his 100 patents, his executive ability in the positions he held and his personality in the honors that were paid him by educational institutions and professional societies.

However fertile Mr. Rice was as an engineer and inventor, it may well be said that he contributed as much as if not more than any other man to the progress of the industry through his rare ability to stimulate and encourage other engineers and inventors to meet the needs that constantly arose in the industrial progress of the art. He could sense a need, pick the men to do the engineering and research and get the financial support for the work despite objections and handicaps because he had vision, courage and a rare personal ability to win acceptance to his ideas. It is not too much to say that the establishment of the Research Laboratory owed its inception and later international renown to Mr. Rice. He realized the value of such an organization, although then unique in industry.

Mr. Rice was born in La Crosse, Wis., in 1862. He was granted honorary degrees from Harvard, Union, Pennsylvania and Rensselaer. He was a Chevalier of the Legion of Honor, past-president of the American Institute of Electrical Engineers, member of many professional and honorary societies and an officer in many corporations. The career of this pioneer as well as his influence upon his company and the industry place him very high in the electrical Hall of Fame.

Typical of the many comments and tributes to Mr. Rice from leaders in the industry are the following:

**Owen D. Young:**

"No greater privilege has ever been afforded me than my intimate association with Mr. Rice for more than 20 years. No man whom I have ever known combined so well the vision of the idealist and the investigation of the student, with the daring and restraint of the practical man of business. His service to the General Electric Company and through it to the electrical industry not only in this country but the world cannot be overestimated. It was unlike the service of any one else. It stands alone and will ever do so."

**Elihu Thomson:**

"Nothing in recent years has touched me so deeply as the sudden loss of my very dear friend Mr. Rice. For more than 60 years our association had continued. It began with him as a bright pupil in the Boys' Central High school in Philadelphia, a leader of his class. This friendship has continued all through our lives in the organization which is now the General Electric Company. It is not necessary to add any words concerning the sweetness of his character nor do I need to refer here to the many honors which have come to him during his active life."

**Frank W. Smith:**

"I deeply regret to learn of the death of E. W. Rice, Jr., honorary chairman of the board of the General Electric Company. His contributions to the electrical industry in a technical and administrative capacity will long be remembered. He possessed a rare combination of ability and genius and since the pioneering days in the industry he has been recognized for his creative work in the development of the art. He has always been admired for his lovable character, and having known him intimately over a long period of years his passing will be a personal loss."

# Carrier Current Controls

## High-Frequency Impulses Simplify Regulation of Illumination for Large Urban Area—Telephone Interference Negligible

HOLLYWOOD ornamental street lighting is now controlled by carrier current. In an area of approximately 10 square miles more than 10,000 lights nightly respond to this type of control. Recognizing the size and importance of the street-lighting load, the Bureau of Power and Light for some time has sought a reliable system of centralized control that could be adapted to serve street-lighting circuits from commercial distribution lines. Up to the present time the carrier-current installation has met every requirement of the service demanded by the bureau. While the installation was adopted as a matter of better service rather than economy, it may eventually prove to be even more economical than the control it displaced.

At the time of the installation, the ornamental street-lighting circuits in Hollywood were mostly series, although a number of the older were multiple. The series circuits were served from constant-current regulating transformers on poles or in vaults and switched by solenoid oil switches originally controlled by low-voltage time switches. Oil switches were of the "latch-in" type, some designed for straight on-and-off switching, others arranged to switch two circuits on at dusk, turning one off at midnight and the other off at dawn. Multiple circuits were either 110-volt, two-wire, or 110/220-volt, three-wire. At present street-lighting load in the area totals 3,000 kw.

The distribution system in the area is three-phase, 4,600-volt, isolated delta, operating at a frequency of 50 cycles. Two 33-kv., 4,600-volt substations have been equipped with high-frequency transmitters, one station having two banks of three 5,000-kva. transformers each and the other two three-phase transformers rated 7,500 kva. each. All transformers have an inherent reactance of approximately 10 per cent. Each station is provided with a double bus, enabling any number of feeders to be connected to either or both transformer banks.

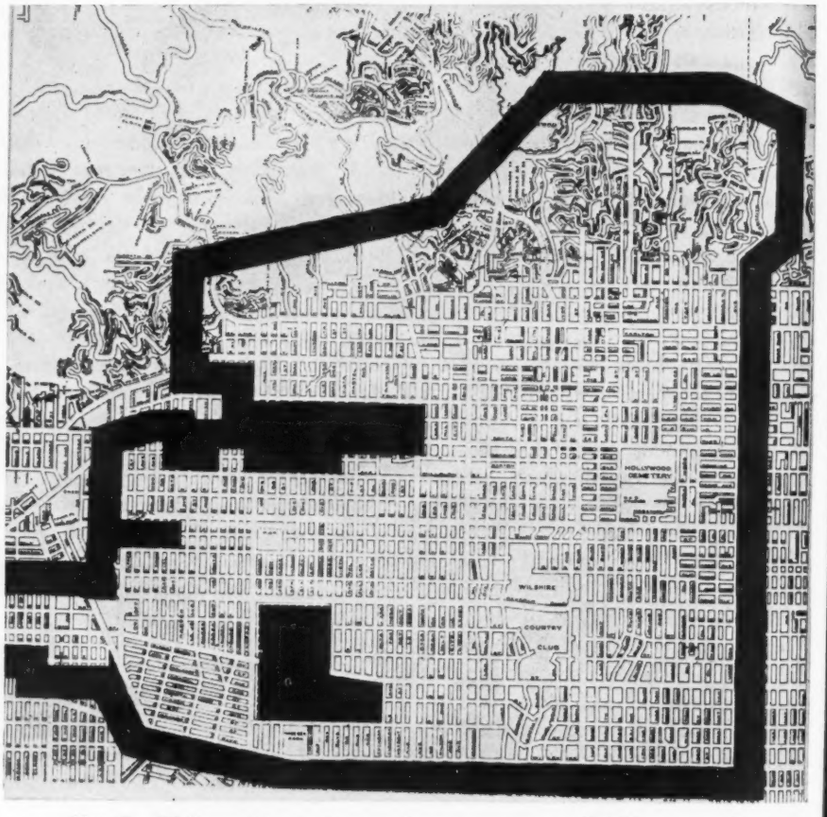



**Fig. 1—Hollywood area has carrier-current street-lighting control**

In one station there are eighteen individually regulated feeders and in the other seven. Feeders extend from the station in 500,000-circ.mil, 5,000-volt lead-covered cables varying in length from 500 to 7,000 ft. The feeders, which distribute both overhead and underground, involve approximately 75,000 ft. of 500,000-circ.mil, 5,000-volt, three-conductor covered cable, together with 40,000 ft. of No. 4/0 and 70,000 ft. of No. 2/0 overhead conductor, besides the overhead and underground branch primary conductors at various points. Peak loads on the two stations are 18,000 and 5,800 kw., respectively.

### *Transmitters are 700 cycle*

The carrier-current control installation operates by superimposing a 700-cycle impulse on the bus at the distributing substation. High-frequency impulses travel out on the distribution system and are stepped down through the distribution transformer to the secondary. Controllers connected to the secondary respond to the carrier-current impulses and actuate the street-lighting switches.

Each transmitter consists of a motor-

# Hollywood Street Lights

By O. W. HOLDEN
Junior Electrical Engineer
Bureau of Power and Light,
City of Los Angeles, California

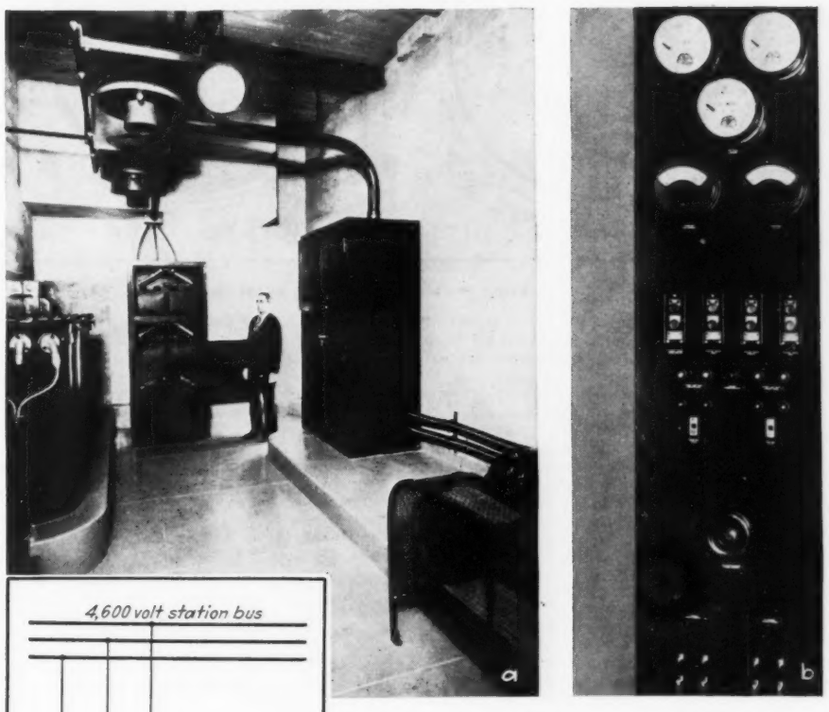
alternator set, a high-frequency output transformer, a tuning inductance, a coupling capacitor, bus oil circuit breakers, together with control and relay panels and equipment. The alternator, driven by a two-speed induction motor, is rated at 50/30 kva. and 700/460 cycles, the double rating providing for future possibility of off-peak load control. The output transformer has a capacity for 52.5 kva., the induction coils are rated at 2.5 mil henrys and the capacitors are in three banks, consisting of four 4.7-mfd. units each. All equipment is designed to carry 200 amp. of 700 cycles current.

### *Street-lighting controllers*

Each controller consists of a capacitor and a reactance which forms the high-frequency pass filter, a rectifier to convert the high frequency into direct current for energizing the relay, a synchronous motor driving a cam to actuate the contacts and a hand switch for manual testing. Controllers are built in two forms, one for multiple circuits and the other for solenoid switch operation. Controllers operate on a complete cycle which include contacts for both "on" at dusk and "off" at midnight and "off" at dawn. By optional connections either or both of the "off" operations can be used in any controller.

In action the operation of the two controllers is identical. The multiple controllers simply actuate two contacts, one closed between dusk and midnight and the other between dusk and dawn. The other type is equipped with three contacts, which close for two-second periods at dusk, midnight and dawn. The "dusk" contact can be shifted four seconds earlier or later in order to stagger the "on" switching of the load, thus reducing the shock on the distribution system.

Operation of the transmitter is very



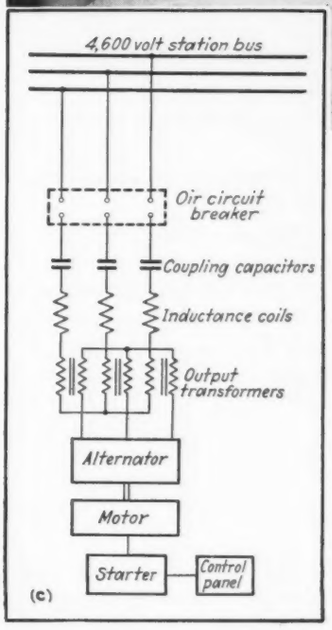
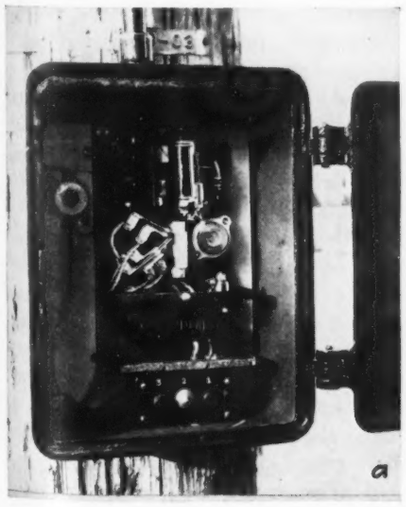




**Fig. 2—Equipment concentrated and isolated**

(a) Carrier-current equipment room, showing, at the extreme right, a portion of the motor-generator set, overhead, the mounting of the inductance coils and, at the far end of the room, the coupling capacitors and cabinet containing automatic starting equipment. (b) Control panel at the substation showing push-button controls, indicating lamps and bus selecting jacks. (c) The coupling scheme for 50 and 700 cycles.



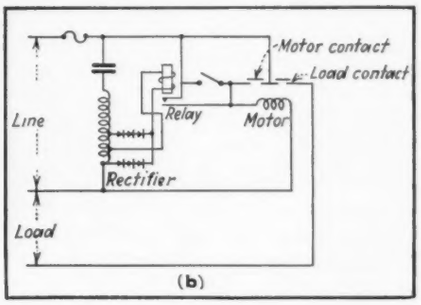




**Fig. 3—Pole-mounted controllers inclosed in cast-iron box**

(a) The buttons under controller provide independent manual switching, if desired. (b) Schematic diagram for light controller.

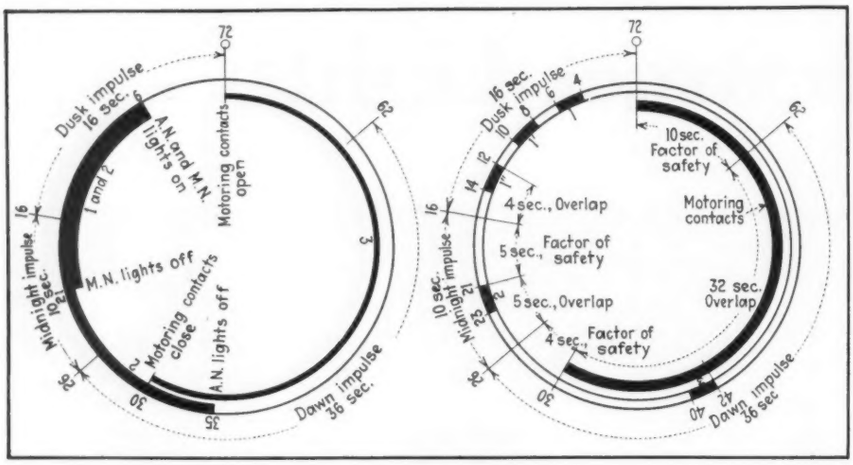



**Fig. 4—Time cycles for lighting sequence**

Assuming all controllers in the normal off or zero position at dusk, an impulse from the station is thrown on the system and all controllers start action. At six seconds all of the multiple controllers close their contacts. At four, eight and twelve seconds, depending on their individual adjustment, the "on" contacts of the controllers for the solenoid switches close for two seconds, actuating the "on" solenoids. At sixteen seconds the impulse is taken off the system and the controllers stop.

At midnight, the cycle being 16 seconds along, the impulse is again thrown on the system and all controllers start action. At 21 seconds the midnight contacts of the multiple controllers open and the midnight contacts of the controllers for solenoid switches close for two seconds, tripping the midnight lighting circuits.

At dawn, the cycle being at 26 seconds, a third impulse is thrown on. At 30 seconds the motor contacts of all controllers close. At 35 seconds the multiple controllers open their all-night load contacts, the motor contacts remaining closed. At 40 seconds the dawn contacts of the controllers for the solenoid switches close for two seconds, tripping off the all-night circuits. At 62 seconds the impulse is taken off, all controllers continuing, however, to 72 seconds, when the motoring contacts open by action of the cams, the motors stop and the controllers are in readiness for a new cycle.

If the controller should stop at any point between zero and 30 seconds an all-night impulse of 36 seconds will resynchronize the controller to 72, which is also zero. Should the impulse be taken off the line after the controller has reached 30 the motor contacts will have closed and the controller will automatically travel to 72 seconds.

simple. At switching time the operator pushes a button which starts the motor-alternator. When full speed is attained a lamp on the panel glows. The operator then inserts a plug in the jack corresponding to the bus which he desires to control and pushes the appropriate "dusk," "midnight" or "dawn" button, which through timing relays closes the bus oil circuit breaker for the pre-set period of time, sixteen seconds at dusk, ten seconds at midnight and 36 seconds at dawn. The plug is then changed to the other bus jack and the selected button again pressed. Pushing the stop button shuts down the motor-alternator. Should a failure occur all controllers can be resynchronized by a "dawn" impulse and the cycle repeated.

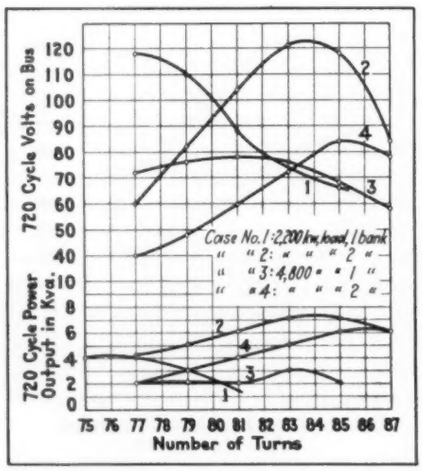



**Fig. 5—Cut-and-try tests determined most favorable timing for all operating conditions**

On each bus connected through a potential transformer is a controller identical with those used in the field, these controllers lighting indicating lamps on the control panel, thus duplicating the field performance of street-lighting circuits connected to the respective buses. Connected to each controller is another lamp which glows whenever the controller is motoring, which warns the operator against starting a new impulse before the previous impulse has completed its action. The operating cycle of the controller can be followed by referring to Fig. 4.

No difficulty was experienced in putting the control into service. After installation it was necessary to adjust the station tuning inductance first to resonate each phase separately through a local circuit involving the generator, transformer, inductance and capacitor, then to check the resonance with the transmitter connected to the distribution system at different load conditions. From curves plotting number of turns against kva. output and bus volts under load and transformer bank variations a compromise point was readily determined for permanent connection (see Fig. 5).

Controllers are designed to operate on a minimum of 1.25 volts of 700-cycle current. However, the actual high-frequency voltages obtaining at the controller in the field are maintained somewhat over two. Inasmuch as these voltages add vectorially, the effect of the impulses at the consumer's lamp is not perceptible. A special resonant voltmeter is used for measuring the 700-cycle voltage which can be used directly on the distribution secondaries.

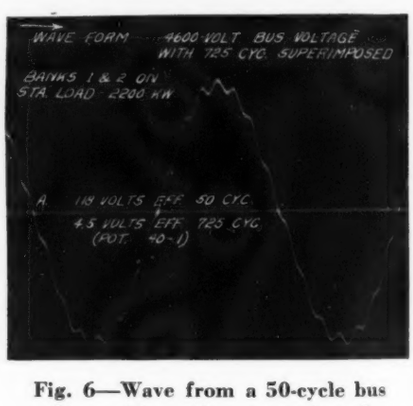

WAVE FORM 4600-VOLT BUS VOLTAGE WITH 725 CYC. SUPERIMPOSED
BANKS 1 & 2 ON
STA. LOAD 2200 KW
A 119 VOLTS EFF. 50 CYC.
4.5 VOLTS EFF. 725 CYC.
(POT. 40-1)

**Fig. 6—Wave from a 50-cycle bus voltage with carrier-current impulse superimposed**

Extensive tests made by the telephone company in the area covered by control proved that although the effect of the carrier-current impulses could be readily detected by listening, the noise level was not such as would occasion complaints from subscribers.

With centralized control it is possible to provide better street-lighting service by switching street illumination on in accordance with minimum adequate light intensity rather than relation to sunset and sunrise, governing the switching by indications of a photo-electric cell. Furthermore, the dual rating of the high-frequency set will provide an opportunity for off-peak load control, should such operations prove desirable at any time in the future.

# Building Load With Small Appliances

## A Comparison of Sixteen Power Companies Outstanding in Small Appliance Sales Last Year—Methods They Used and Results Gained—The Opportunity and the Record

BACK in 1905 the electric light companies were all excited over the idea of selling small heating appliances. These ingenious devices had just been invented—or were not in use long—and everybody was enthusiastic about them. In Los Angeles they gave away 25,000 flatirons to get them on the lines. Chicago did about the same thing. Toasters, percolators, hot plates, chafing dishes—they looked a bit crude by modern standards, but they were all there and they did a good job.

Now, after all these years, the interest of the utilities in these small appliances—in all their modern variety—is again growing. For a long while this kind of minor load-building equipment has received scant attention because the major selling effort has been concentrated on larger game, and this shelf merchandise has been left to the dealers. But of late the pressure for a larger average domestic consumption to carry lower rates and high taxes has led many companies to study their customers as they never have before. The possibilities for putting the minimum bill customer on a paying basis and the opportunities for broadening the use of electrical equipment in the home have become matters of importance to the management.

Small appliances naturally loom large in this picture. And that's why the appliance manufacturers in N.E.M.A. and the Edison Electric Institute have been co-operating in a table cookery campaign. And the fragmentary figures, available at this time of the year, show a general increase in production. Manufacturers are busier than they have been for many years. Better selling by the power companies is credited as being the principal influence plus, of course, the better times.

Certainly there is a tremendous market for this merchandise. The present saturation of percolators is

## Small Appliance Sales by Sixteen Power Companies

**A comparison of local conditions, the methods used and total sales by these utilities and also by local dealers where they could be estimated**

**TABLE I**

| Company | Total Domestic Consumers Dec. 31, 1934 | Av. Total Dom. Consumption June 30, 1935 | Av. Revenue from Dom. Cons. 1934 | Av. Rate per Kw.-Hr. to Dom. Customer-Cents | Av. Sales of Appl. per Cons. 1934 | Total Small Appliances Sold by Power Company | | | | | | Total Small Appliances Sold by Dealers—Est. | | | % of Total Sales by Dealers 1934-33 | No. Selling Small Appliances Av. 1934 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6 Mos. 1935 | 1934 | 1933 | 1932 | 1931 | 1930 | 6 Mos. 1935 | 1934 | 1933 | | Outside Salesmen | Store Salesmen | Service Women |
| A | 764,613 | 766 | $33.69 | 4.4 | $4.46 | 47,735 | 107,892 | 97,034 | 104,516 | 159,198 | 134,015 | ..... | ..... | ..... | ..... | 228 | 65 | 4 |
| B | 713,621 | 511 | 34.42 | 4.5 | 3.47 | 23,647 | 51,577 | 48,070 | 38,241 | 48,749 | 56,731 | ..... | 250,000 | 225,000 | 83 | 332 | 37 | 12 |
| C | 533,123 | 675 | 34.30 | 5.5 | 3.75 | 18,879 | 21,962 | 18,071 | 28,394 | 50,800 | 64,059 | ..... | 439,240 | 361,420 | 95 | 181 | 66 | ..... |
| D | 476,896 | 719 | 28.99 | 4.0 | 1.48 | 18,311 | 32,823 | 22,009 | 27,275 | 36,282 | 45,276 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| E | 300,690 | 609 | 33.96 | 5.0 | 2.98 | 6,274 | 17,732 | 14,738 | 12,938 | 18,891 | 22,398 | 13,500 | 93,570 | 60,000 | 83 | ..... | 20 | 16 |
| F | 295,793 | 530 | 35.75 | 5.0 | 5.09 | 5,029 | 14,019 | 14,666 | 6,723 | 8,117 | 9,584 | 18,528 | ..... | ..... | ..... | 201 | 67 | 21 |
| G | 279,611 | 754 | 34.54 | 4.5 | 3.09 | 5,910 | 18,561 | 14,237 | ..... | ..... | ..... | 59,100 | 154,700 | 118,600 | 89 | 13 | 12 | ..... |
| H | 232,403 | 643 | 37.99 | 5.0 | 3.37 | 17,498 | 46,925 | 38,114 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | [D]61 | 50 | ..... |
| I | 197,706 | 707 | 30.05 | 4.5 | 2.56 | 8,000 | 20,000 | 15,000 | 12,000 | 17,000 | 23,000 | ..... | ..... | ..... | ..... | ..... | 6 | 1 |
| J | 147,371 | 704 | 33.60 | 4.5 | 7.95 | 5,587 | 19,780 | 16,617 | 11,811 | 15,392 | 17,419 | ..... | 70,000 | 58,000 | 78 | 150 | 15 | ..... |
| K | 126,665 | 687 | 40.95 | 4.0 | 7.65 | 4,297 | 21,854 | 16,834 | 15,597 | 19,299 | 19,301 | 3,000 | 18,000 | 15,000 | 46 | 58 | 26 | 12 |
| L | 120,033 | 888 | 35.53 | 4.5 | 20.40 | 18,091 | 50,263 | 22,875 | 23,176 | 26,289 | ..... | 18,000 | 18,000 | 15,000 | 31 | [EF]125 | 20 | 55 |
| M | 94,271 | 774 | 31.96 | 5.3 | 19.35 | 21,284 | 35,458 | 15,188 | 13,817 | 12,933 | ..... | ..... | ..... | ..... | ..... | 16 | 4 | 12 |
| N | 93,000 | [A]732 | ..... | ..... | ..... | 8,500 | 21,253 | 18,250 | ..... | ..... | ..... | 60,000 | ..... | ..... | ..... | 18 | 15 | ..... |
| O | 75,416 | 871 | 33.44 | 3.3 | 15.20 | 3,829 | 15,950 | 5,828 | 7,102 | 6,970 | 10,999 | ..... | ..... | ..... | ..... | [E]29 | 2 | 14 |
| P | 67,430 | 797 | 54.21 | 8.0 | 6.57 | 6,375 | 16,897 | 3,239 | 6,474 | 8,193 | 7,942 | 20,960 | ..... | ..... | ..... | ..... | 6 | 18 |
| Total | 4,518,642 | [B]709 | [B]35.56 | [C]5.0 | [B]7.16 | 219,246 | 512,946 | 380,770 | 308,064 | 428,113 | 410,724 | 193,088 | 1,043,510 | 853,020 | ..... | 1,412 | 410 | 165 |

[A]This figure not included in average. [B]Straight line average. [C]Weighted average. [D]Outside salesmen not encouraged to sell small appliances. [E]4,000 employees also encouraged to sell small appliances. [F]6 Salesmen sell to employees only.

**TABLE II**

| | Compensation of Salesmen | Installment Sales, Maximum Time | Min. Amount | How Extensive Is Promotion | Dealer Co-operation |
|---|---|---|---|---|---|
| A | Outside salesmen. Straight com. 10% to 18%. Store salesmen salary $75 a mo. plus ½% | 12 months | $5.00 | Continuous promotion—Campaigns on flatirons, I.E.S. portables, coffee makers, heat pads, roasters | Finance dealer sales up to total $1,000. Company collects. |
| B | Com. 20% with guarantee $65.20 a month | 10 months | 1.00 down & 1.00 a mo. | Monthly adv. and display. Bonus to employees for leads. Campaigns on flatirons, toasters, grillettes, I.E.S. lamps | Co-op. through league, tie dealers into campaigns. |
| C | Salary & com. aggregating 11% of net sales plus variable bonus during special sales | ..... | 10.00 | Periodic intensive selling. Special salesmen work on minimum bill customers. Campaigns on sunlamps, heat pads, flatirons, radio, space heaters, portables, waffle irons, toasters, mixers, fans, coffee makers | ..... |
| D | Sold by salaried commercial employees | 12 months | 15.00 | None, except campaigns on roasters, and casseroles | Features dealer in adv. |
| E | Salary | 12 months | 5.00 | Campaigns on cookers, flatirons, waffle irons, clocks, roasters, mixers, I.E.S. lamps | None |
| F | Salary $55 a mo. plus load bonus | Varies with price | 5.00 | Moderate newspaper and mail adv. Campaigns on heat pads, flatirons, percolators, Xmas gifts | Features dealer in adv. Sales training |
| G | Salary $65 to $90 a mo. plus com. 4% on first $500; 12% on next $1,000 and 15% on add. monthly sales | 6-10 months | 2.95 | Featured in regular adv. and broadcasting. Campaign on clocks. All merchandising through subsidiary | Adv. features dealers, some financing |
| H | Salary and com. | 12 months | 1.00 per mo. | Some newspaper adv. One appliance featured each month | Keep dealers informed on plans |
| I | Salary $80 to $100 plus bonus 1% on sales | 10 months | 1.00 per mo. | Newspaper adv. Spend 7% of gross sales. Campaigns on roasters, casseroles, mixers | Co-op. in shows and demonstrations |
| J | Com. 16% for cash, 25% on min. down payment, 14% for all other time payment sales | ..... | ..... | Spend $2,000 on mail adv. Campaigns on flatirons, percolators, mixers, I.E.S. lamps | Adv. features dealers |
| K | Com. plus load bonus aggregating about 20% of sales | ..... | 10.00 | Campaigns on flatirons, mixers, radiators, toasters, roasters, waffle irons, casseroles | Limited newspaper adv. features dealers |
| L | All salaried salesmen sell small appliances. Pay 6% load bonus | 6-12 months | 1.00 down & 1.00 a mo. | Four or five all-employee campaigns yearly. Employees sell appliances priced $25 or less continually. Campaigns on kitchen light, coffee maker, flatirons, pin-it-up-lamps and bulbs. Xmas gifts | None |
| M | Straight com. 12% plus minimum down payment bonus 2% | 6-15 months | 2.00 | Continuous to small bill consumers. Com., prizes, bonus to all employees. Campaigns on flatirons, fans, percolators, waffle irons, air heaters, I.E.S. lamps, bulbs | Limited support adv. |
| N | Outside salesmen, salary $65 plus com. 7½%; inside salesmen salary $75 plus com. 1%-2%. Sometimes load bonus for both | 12 months | Everything | Continuous general adv., newspapers, displays, some broadcasting. Campaigns on roasters, coffee makers, sunlamps, large bulbs | Co-op. adv. campaigns, no price cutting, display service, shows |
| O | [a]Com. 5% on sales, plus volume bonus, plus down-payment bonus | 6-15 months | 1.00 down | Newspaper adv. sales contests, campaign flatirons to low bill consumers | Support in general adv. only |
| P | Salaried employees paid 5% com. plus bonus during sales | 6 months | 1.50 | Employee campaigns on toasters, casseroles, handilites, I.E.S. lamps, bulbs | Dealers tied into all campaigns; finance, 10% down—6 mos. max. time, no carrying charge. Regular contact |

[a]Other employees 10% com.

only 31 per cent. Heat pads stand 15 per cent and hot plates 13, waffle irons 18, radiators 18, cookers 6 and toasters 46. Flatirons are 98 per cent saturated, according to the statistics, but these are tricky figures. For it doesn't mean that all but 2 per cent of connected homes are ironing electrically. Most minimum bill consumers have no flatirons nor any other appliances, and these minimum bill customers number 40 per cent or more of all households on the lines in most cities.

And this does not take account of unnumbered out-of-order appliances nor those lying idle on a closet shelf. So since a flatiron is good for 50 kw.-hr. a year and a toaster, percolator or waffle iron for 20 each and a grill for 25 and a mixer for 10, there is plenty of load to be built with them, since there are plenty of customers to sell. Like other load building, it gets down to a matter of promotion and merchandising, to man-power and methods.

The accompanying tables show an interesting comparison of the methods that have been followed by a group of sixteen power companies in the sale of small appliances. These are the companies which stood out as having been most active in this type of merchandising among the 100-odd utilities that were listed in the analysis of appliance selling in 1934, published in ELECTRICAL WORLD on March 2. They are presented here in detail because this kind of a tabulation reflects both policy and practice and points out neglect

## Ten Years' Sales of Eleven Small Appliances

Total sales in the United States as computed by *Electrical Merchandising*—Saturation as of January, 1935

**TABLE III**

| Small Appliances | Saturation, Jan., 1935 | 1934 | 1933 | 1932 | 1931 | 1930 | 1929 | 1928 | 1927 | 1926 | 1925 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clocks | 41.8 | 2,100,000 | 2,000,000 | 2,400,000 | 2,800,000 | 1,400,000 | 400,000 | 130,000 | 95,000 | 90,000 | 60,000 | 11,475,000 |
| Cookers | 6.3 | 40,000 | 35,000 | 51,000 | 72,000 | 145,000 | 150,000 | 100,000 | 200,000 | 175,000 | 175,000 | 1,143,000 |
| Heaters | 18.2 | 168,490 | 184,820 | 178,700 | 294,343 | 242,400 | 303,000 | 273,000 | 450,000 | 448,000 | 400,000 | 2,942,753 |
| Heating pads | 15.5 | 332,819 | 356,687 | 321,300 | 492,000 | 433,500 | 637,500 | 510,000 | 470,000 | 230,000 | 200,000 | 3,983,806 |
| Hot plates | 13.8 | 302,217 | 392,490 | 273,140 | 535,000 | 270,660 | 347,000 | 346,000 | 315,000 | 300,000 | 250,000 | 3,331,507 |
| Irons | 98.1 | 2,867,000 | 2,430,400 | 1,858,400 | 2,154,889 | 2,362,500 | 3,150,000 | 3,000,000 | 3,000,000 | 3,000,000 | 2,750,000 | 26,573,189 |
| Percolators | 31.6 | 316,429 | 246,003 | 201,600 | 399,159 | 856,500 | 1,295,800 | 1,472,000 | 450,000 | 400,000 | 350,000 | 5,987,491 |
| Toasters | 46.8 | 956,553 | 831,786 | 960,000 | 1,281,700 | 1,263,000 | 1,540,000 | 1,400,000 | 675,000 | 600,000 | 500,000 | 10,008,039 |
| Waffle irons | 18.4 | 429,452 | 447,345 | 458,700 | 652,466 | 683,500 | 768,000 | 718,000 | 400,000 | 180,000 | 150,000 | 4,887,463 |
| Fans—desk | ..... | 958,400 | 599,000 | 313,000 | 642,600 | 819,000 | 673,000 | 789,000 | ..... | ..... | ..... | 4,794,000 |
| Mixers | ..... | 300,000 | 350,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 650,000 |
| Total | ..... | 8,771,360 | 7,873,531 | 7,015,840 | 9,324,157 | 8,476,060 | 9,264,300 | 8,738,000 | 6,055,000 | 5,423,000 | 4,835,000 | 75,776,248 |

as well as achievement. And the results shown are worth checking against the record of any other operation.

Embraced in the total unit sales of these sixteen companies are the full variety of miscellaneous small appliances—table cookery equipment, small kitchen devices, study lamps, probably a few sewing machines—pretty much anything except ranges, water heaters, refrigerators, clothes washers, ironers and vacuum cleaners. It's like adding camels and caterpillars—to get what? But they're all "varmints" and it gives an interesting total in that it indicates activity in its relation to the size of the communities and the methods employed.

In size these companies vary all the way from 764,613 to 67,430 domestic consumers. Local conditions show the usual diversity. Average domestic consumption runs from 888 and 871 to 530 and 511 kw.-hr. a year. Average revenue from residence customers shows a high of $54.21 and a low of $28.99. Rates average from 4 to 5 cents, with one 8 cents high. Average appliance sales for domestic consumers ranges from $20.40 and $19.32 as low as $2.56 and $1.48. Selling staffs run all the way from 369 to 6, and this, of course, means little, because in most cases only part time is spent by any of these salesmen on small appliances. But the relation between total number of units sold and the staff of outside and inside salesmen and domestic service women reported as engaged in the development of small appliance load is worth noting. Also, the relation between the size of the staff responsible for pushing this merchandise and the promotional program that supports them is something else.

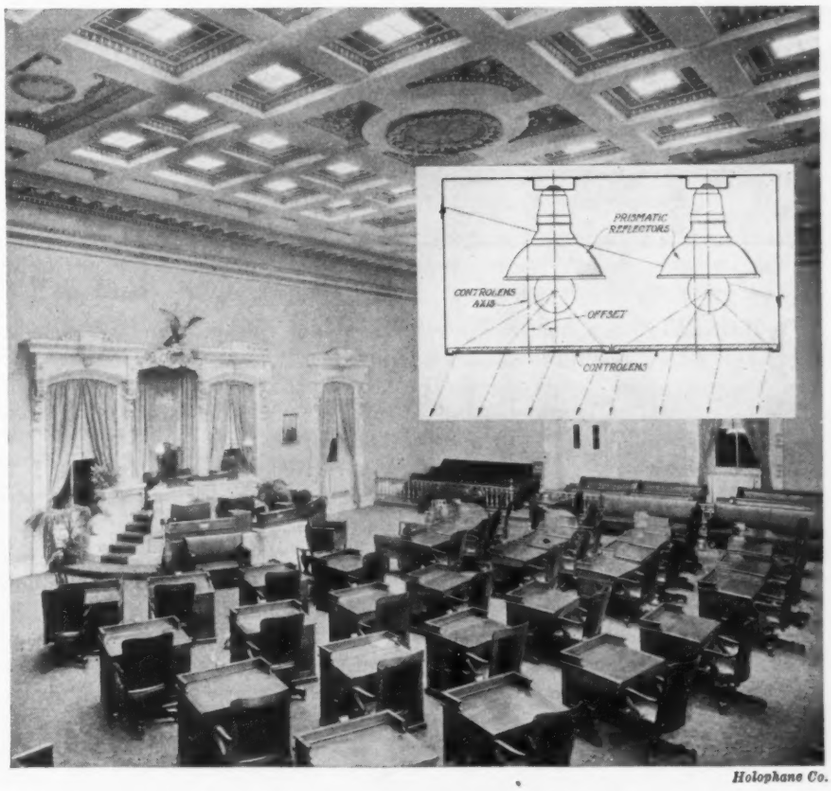
The aggregate sales by these sixteen companies increased from 380,770 units in 1933 to 512,946 in 1934. The six months of 1935 figures indicate a further gain for this year, when you allow for the Christmas season that lies ahead. But the sales of the individual companies are up or down according to the intensity of their selling. And that, of course, is the lesson of the tables. If it were not, the total sales would follow closely the number of the local consumers, for most of this merchandise is well known in the market.

Only the two largest companies hold their one-two position in total sales—for the past eighteen months, say. The third company in size stands seventh in sales, the fourth in size stands sixth, the fifth thirteenth, the sixth sixteenth, the seventh twelfth. Company L, twelfth in size, rates third in sales, and company M rates fifth in sales. Why? Because they put on the pressure and interesting evidence is found in the column where the promotion program is set down. All these companies listed here conduct campaigns on small appliances, but some push only two or three devices, some drive on all. And those which drive on all, sell all.

The dealers play an important part in the sale of small appliances and retail about 74 per cent of the national total. Their value to the utility as builders of this type of load is indicated by the total dealer sales reported by the eight companies which have been close enough to what the dealers are doing to be able to make an estimate. It would seem that it would be worth while for all power companies to encourage and support the dealer in pushing this merchandise, to co-operate in any way possible to stimulate active campaigns and promote liberal trade policies. But among this very active group of utilities, two finance dealer sales, three tie the dealers into company campaigns, four feature the dealers in company advertising on small appliances and six say they merely keep the dealers informed as to what they are doing. As to cooperation, some just say "none."

This year department and chain store sales of small appliances are running large. Drug store sales are somewhat smaller than in 1934. Electrical dealers are selling more because buying is on the increase. But the power company is needed in the marketplace, if any large improvement is to be made quickly. The most spectacular results gained recently by utilities in small appliance selling has been through all employee campaigns, where they all go out and "ask 'em to buy." It works, and the dealers find that they benefit also, because public interest is whipped up and more people buy from their neighborhood stores. For after all, popularity builds demand and popularity is the product of publicity and promotion.

## LEGISLATORS IN ILLUMINATED ENVIRONMENT

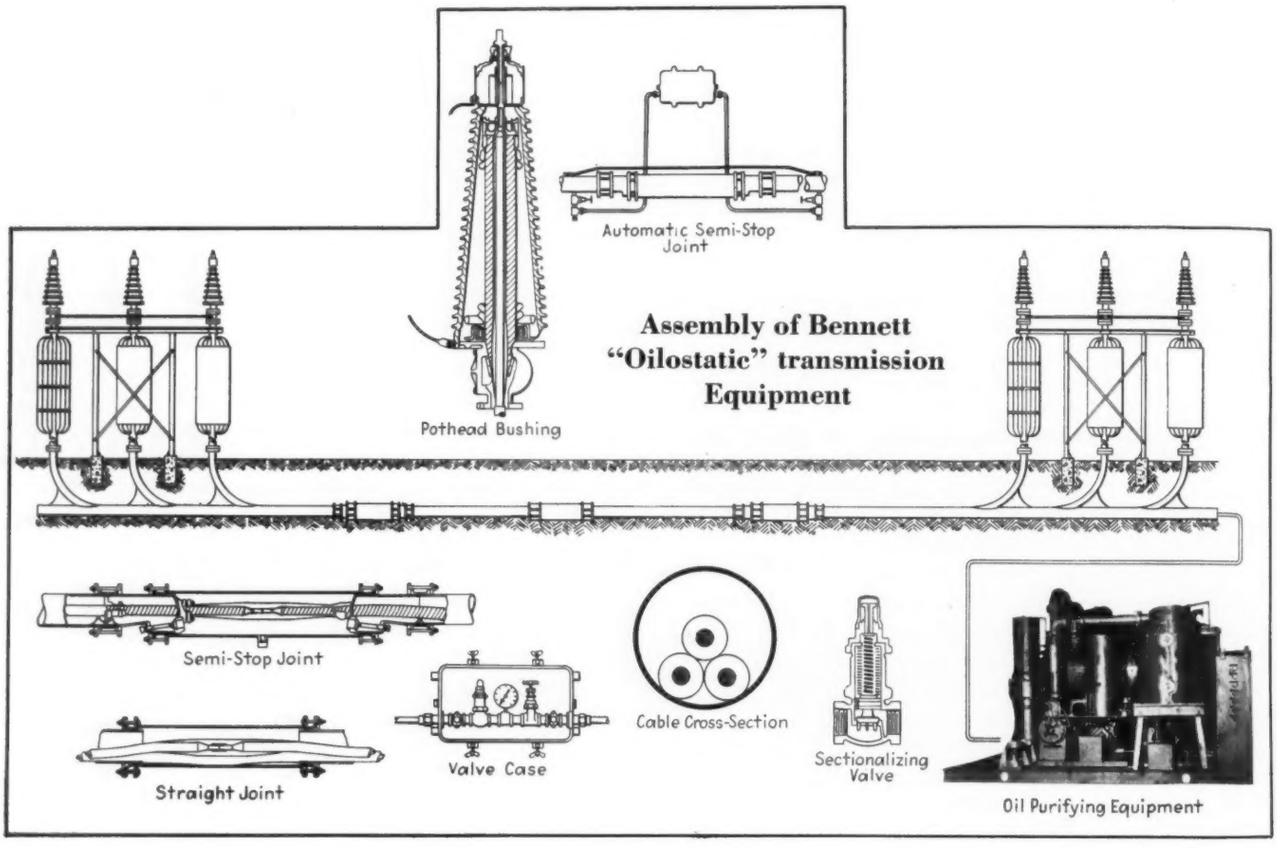



*Holophane Co.*

**Light intensities of 15-25 foot-candles are obtained on these desks in the Ohio Senate Chamber with an expenditure of 6 watts per square foot of active floor area. Twenty-eight in-built ceiling fixtures, containing four 150-watt lamps, each mounted over a foot square "Controlense," diffuse light to all parts of the chamber floor.**

# High-Pressure Oil Cable—

## *A New System With New Equipment*




OILOSTATIC is a complete, new system of underground transmission that is economical, simple and flexible. The high points in regard to the new cable system are as follows:

1. It is a simple cable system drawn into an oil-filled pipe line, the oil being kept under high pressure by simple apparatus.

2. It abandons the lead sheath as a means for mechanical protection and the prevention of moisture admission.

3. It does away with the typical underground duct line with its many joints and manholes.

4. It is the mechanical solution to many electrical problems encountered in ordinary underground cable systems as used today.

5. It opens up future possibilities of a much greater application of underground transmission and distribution.

6. This new cable system can be applied to a wide variety of applications, for example:

(a) High-voltage lines may be brought to load centers in congested districts.

(b) River crossings.

(c) Railway or tunnel installations.

(d) Around airports.

(e) Transmission lines where appearance, right-of-way cost or other obstacles to overhead lines may dictate its use.

7. The new system has low right-of-way cost and a small space factor for transmission capacity.

8. Long pulling lengths of cable may be used, resulting in fewer joints and manholes. It may be installed more quickly and more economically than duct-line high-voltage underground systems.

9. Operating features favor the system. Sheath losses or sheath potentials of single conductor cables are almost eliminated. Stable insulation with complete mechanical protection is obtained. The current-carrying capacity is higher than in other systems as well as the ability to take larger overloads for short periods. Grounding of pipe and system affords an ideal return for relay operations.

10. The system is simple yet flexible, with a low maintenance cost, and it is competitive for many transmission installations, both overhead and underground. Experience with existing Oilostatic installations has already confirmed the economy features of this system.

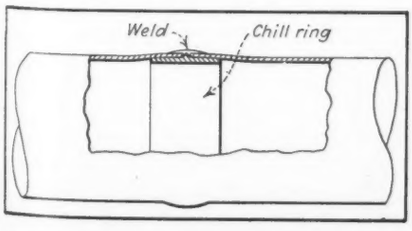
*Insulation Features*—The cable in

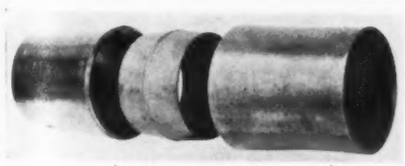
By **CHARLES E. BENNETT . . ROBERT J. WISEMAN**
The Okonite-Callender Cable Company, Inc.

***This is a brief description of the Bennett "Oilostatic" transmission system developed and manufactured by the Okonite-Callender Cable Company, Inc. This new system prevents voids in the insulation and eliminates lead sheath failures—the two chief limiting factors heretofore encountered—which is accomplished by placing the insulated cable under high oil pressure within a metal pipe. In practice, this would often be a welded steel pipe. The pipe, roughly 50 per cent larger in diameter than the circle circumscribing the assembled non-leaded, but insulated conductors, is filled with oil that is maintained at a pressure of 200 lb. per square inch. The Oilostatic transmission system is the practical outcome of intensive research over a period of years. This development offers large economies both in original construction and maintenance and, what is most important, its wide possibilities have already been demonstrated in operation. It is feasible to use the Oilostatic system for underground transmission voltages well above the highest voltages now employed. It has a capacity in current loading 40 per cent in excess of solid cable and 15 to 20 per cent in excess of oil-filled cable installed in ducts.***

the system uses the same thicknesses of insulation as are used in oil-filled cables. It would be possible to use thinner walls if desired, but as the cost reduction would be small, the added higher factor of safety is justifiably provided. Shielding tapes are wrapped over the paper insulation, and over the shielding tape is applied a canvas tape which acts as a protection when drawing the cable into the pipe. The cable is impregnated in a similar manner to that of solid type cable and then a thin lead sheath is applied. This lead sheath is removed when the cable is drawn into the pipe. The cable is tested to meet the A.E.I.C. paper cable specifications and samples are taken for special tests at high pressure, similar to those applied to samples of oil-filled cable.

Cable for the Oilostatic transmission system can be made and shipped in extremely long lengths; in fact, up to at least 5,000-ft. lengths. On long lengths armor wire may be placed over the insulation for pulling purposes. The cable circuit is sectionalized by means of semi-stop joints and terminates in a manifold, with each insulated conductor extending up through its own riser pipe to the pothead.



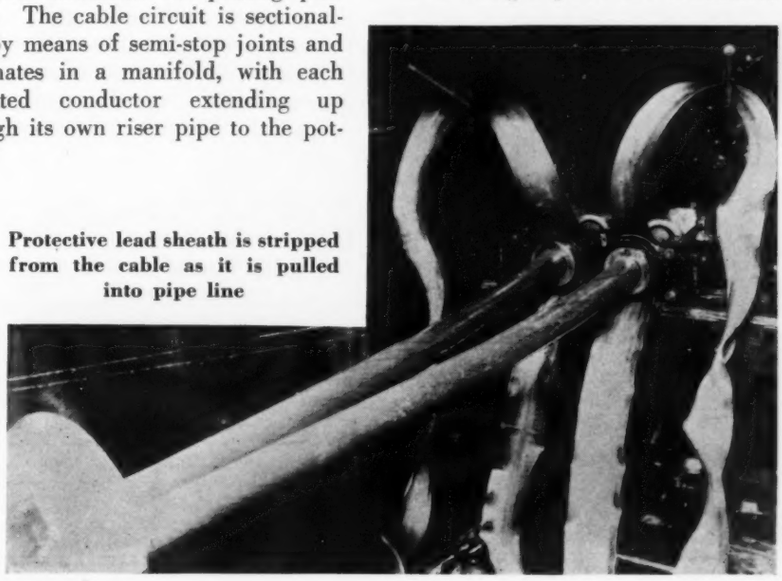
**Type of weld used in the pipe line**

The accompanying table was compiled from researches on the thermal capacity of the system and check tests on installations. It gives the current loadings to be used for all conductor sizes based upon a conductor temperature of 75 deg. C. for circuits up to 75 kv. and 70 deg. C. for circuits over 75 kv.

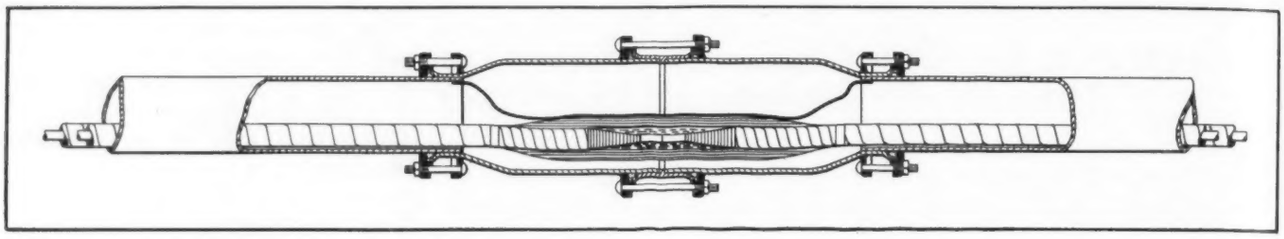
*Pipe Line Features*—Before shipping the pipe is tested for strength and soundness of factory welding. The ends are sealed with special caps to prevent foreign matter from entering the pipe during shipment. In the field the pipe is placed along the trench in which it is to be laid, swabbed and welded together into lengths as long as possible. The type of weld and chill ring used are shown in accompanying illustrations. The chill ring helps to line the pipe, it reinforces the joint and prevents welding icicles from entering the pipe. After a section of the pipe is welded it is given an air test, during which time the welds are inspected for leaks. The pipe is then placed in its final location and is ready to receive the cable.

All cable lengths are pulled at the same time. To each length is attached a pulling eye or special grip and this is attached to a pulling rope by means of a shackle and swivel. The cables are then drawn into the pipe through a flexible feeding tube. As the cable is drawn into the pipes the light lead sheath is stripped off, as shown in the accompanying illustration. After the cable is drawn into the pipe the pulling attachments are removed and the pipe ends sealed by inclosing the cable ends.

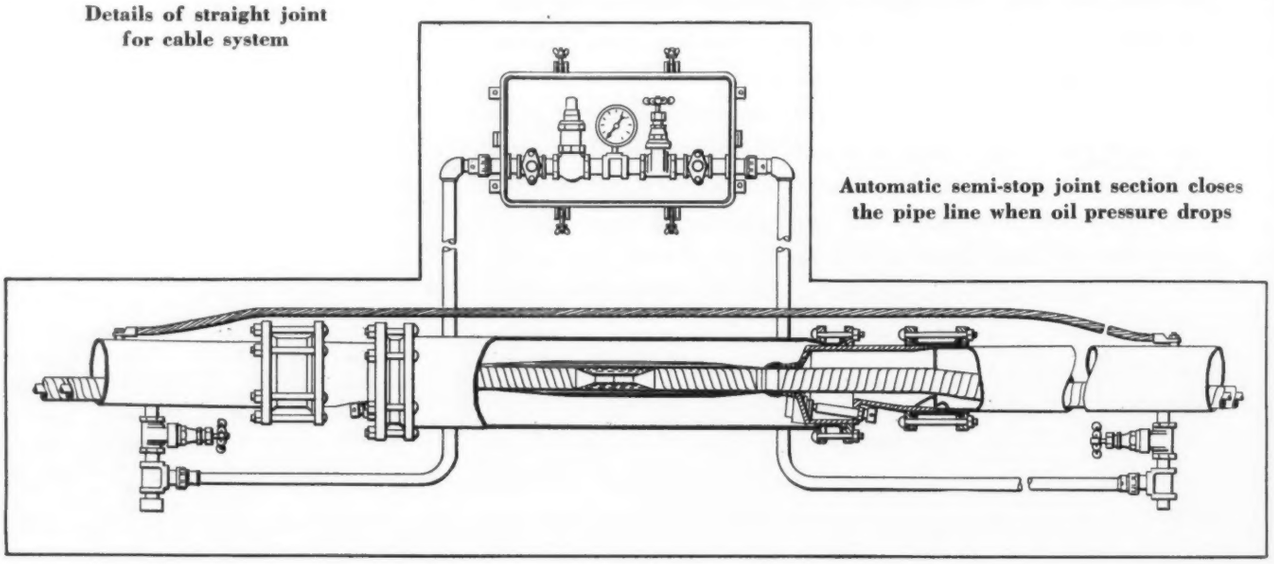
In a straight joint the conductors



**Protective lead sheath is stripped from the cable as it is pulled into pipe line**



Details of straight joint for cable system



Automatic semi-stop joint section closes the pipe line when oil pressure drops

## Current-Carrying Capacity of Oilostatic* Cable Buried in Earth

Permissible current for 50, 75 and 100 per cent load factor for one or two pipes for voltages 35 k.v. to 230 k.v. for several sizes of conductors in the Oilostatic System

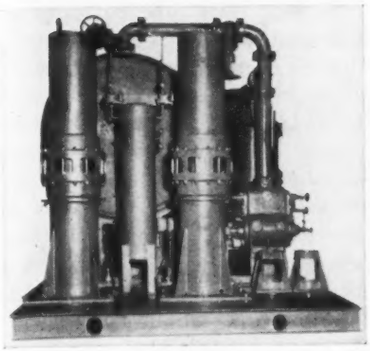
| Cable | | | Pipe (Inches) | | | Current-Carrying Capacity (Amperes) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Single Pipe Load Factor | | | Two Pipes 18-In. Centers Load Factor | | |
| Volts K.V. | Insl. Wall Mils. | Cond. Mcm. | O.D. | I.D. | Wall | 100% | 75% | 50% | 100% | 75% | 50% |
| 35 | 210 | 250 | 4 | 3.548 | 0.226 | 385 | 443 | 516 | 344 | 403 | 478 |
| 35 | 210 | 500 | 4½ | 4.026 | 0.237 | 569 | 662 | 777 | 502 | 595 | 719 |
| 35 | 210 | 1,000 | 5 | 4½ | 0.250 | 832 | 988 | 1,191 | 724 | 874 | 1,083 |
| 69 | 350 | 350 | 4½ | 4.026 | 0.237 | 451 | 519 | 599 | 400 | 470 | 560 |
| 69 | 350 | 500 | 5 | 4½ | 0.250 | 546 | 631 | 732 | 483 | 570 | 681 |
| 69 | 350 | 750 | 5½ | 5 | 0.250 | 681 | 791 | 926 | 606 | 709 | 855 |
| 69 | 350 | 1,000 | 6 | 5½ | 0.250 | 790 | 920 | 1,080 | 687 | 820 | 983 |
| 115 | 535 | 500 | 6 | 5½ | 0.250 | 484 | 555 | 632 | 425 | 501 | 591 |
| 115 | 535 | 750 | 6⅝ | 6⅛ | 0.250 | 612 | 705 | 808 | 534 | 633 | 751 |
| 115 | 535 | 1,000 | 7 | 6½ | 0.250 | 709 | 822 | 949 | 614 | 732 | 878 |
| 138 | 625 | 500 | 6⅝ | 6⅛ | 0.250 | 475 | 542 | 614 | 417 | 490 | 574 |
| 138 | 625 | 750 | 7 | 6½ | 0.250 | 592 | 682 | 782 | 513 | 610 | 727 |
| 138 | 625 | 1,000 | 8 | 7½ | 0.250 | 679 | 781 | 894 | 584 | 697 | 829 |
| 230 | 1,000 | 750 | 9⅛ | 9⅛ | 0.250 | 492 | 571 | 651 | 406 | 501 | 611 |
| 230 | 1,000 | 1,000 | 9⅛ | 9⅛ | 0.250 | 566 | 664 | 764 | 461 | 578 | 704 |

*Reg. U. S. Pat. Off.

are insulated as in an ordinary solid cable joint, the thickness of insulation and length of splice depending upon the voltage. The shield over the splice is connected to the shielding on the cable and a jumper cable is attached to the shielding and the pipe sleeve. This sleeve, slightly larger than the pipe, previously slipped back over the pipe, is then placed in position and fastened in place with a suitable coupling.

A semi-stop joint is obtained by using a bronze bulkhead at each end. With this type of joint the lead sheath is left on the cable end and is passed through the bulkhead and wiped to it. The bulkhead is attached to the pipe by a suitable coupling. The joint is then made as in a straight joint and the large outer sleeve fastened to the bulkheads by couplings.

There are two types of semi-stop joints, differing only in the valves—hand operated and automatic. In the hand operated, the valve in the bulkhead is open, allowing free passage of oil in the joint, and this valve is closed only when it is necessary to sectionalize the lines. In the automatic, the bulkhead is normally closed and the semi-stop joint is by-passed by a pipe connected to the main pipe line at each end. Connected in this by-pass is an automatic valve which is nor-



Side view of pumping plant, with hydro-vollifier, accumulators and pumps mounted on a unit base

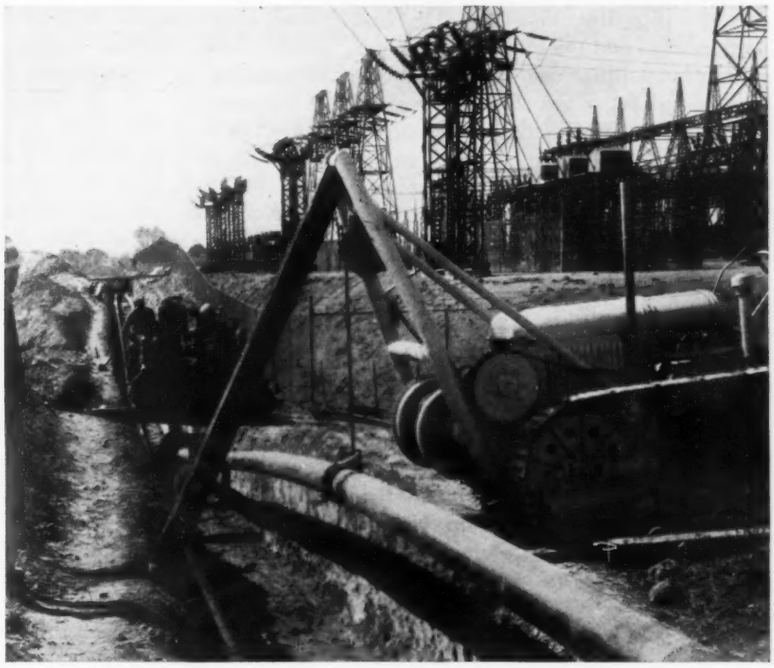
mally open above a predetermined oil pressure, usually about 75 lb. per square inch. When the pressure drops below this value the valve closes, thus automatically sectionalizing the line. (See accompanying illustration.)

*Cable Terminals*—The pipe line terminates in a manifold with separate single-phase risers ending in separate terminals. The terminals, or "pot-heads," are flange connected to the risers. The specially designed, thick inner porcelain tube is placed around the cable which carries the 200-lb. oil pressure to the upper part of the tube. An outer porcelain shell is placed over all and the space between the two tubes is filled with oil under atmospheric pressure.

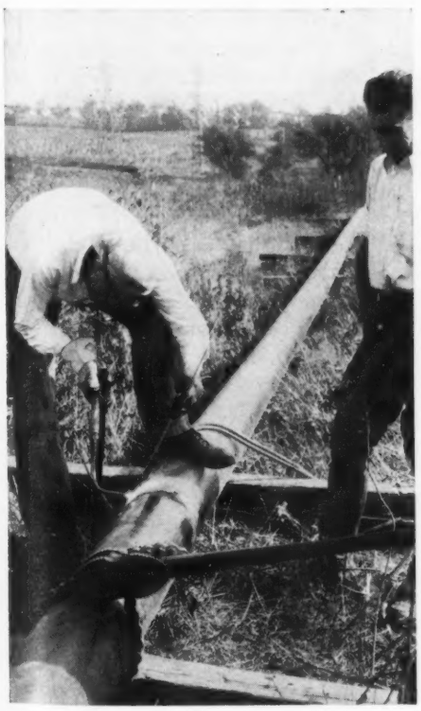
*Oil Storage and Pressure Equipment*—On short lines this equipment is placed at only one location, usually for convenience near a substation and a source of low-voltage power supply for operation of the pump motors.

The equipment may be housed in the basement of a substation, in a small house, or, in some cases, in a

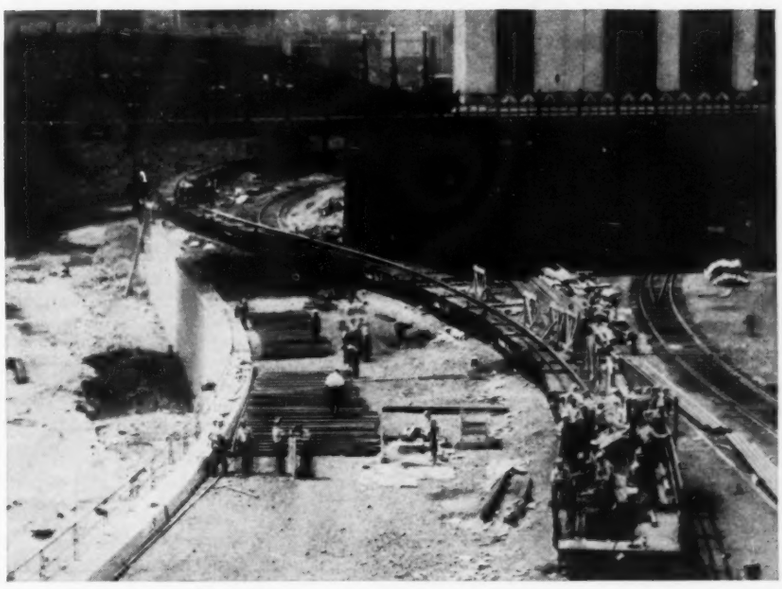
Pipe is bent to conform to trench



Installing a section of pipe line with tractor crane



Field welding of pipe line



Flexibility of welded pipe line permits pipe to be hauled around sharp curves

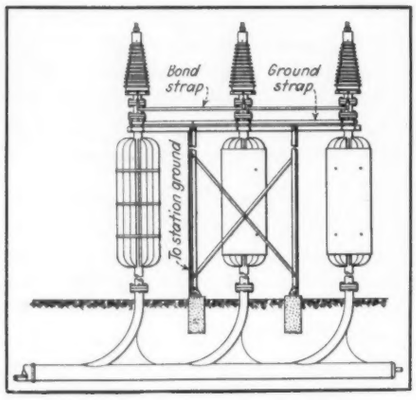
manhole. One or more accumulators are used to take care of the small daily variations in oil volume in the pipe. Large changes of oil are handled by means of relief valves which return the excess oil on expansion to the storage tank, and by means of an automatically controlled gear pump which, on contraction of the oil, raises the pressure to the desired value and cuts off. Oil pressure in the pipe line and the oil level in the reservoir are registered by recording gages which are equipped with alarm contacts set for the maximum and minimum values allowable.

A hydro-vollifier is used when filling the pipe line with oil. The line is evacuated and the oil passes through the hydro-vollifier, which filters, dehydrates and degasifies the oil before it goes into the line. Either a permanent or portable set-up may be used to recondition the oil in the line at any time this is considered necessary.

Various stages of pipe line installation and the flexibility of the welded pipe are shown in the illustrations on page 31. The pipe on the flat cars is being hauled around 18 deg. bends.

Two installations of Oilostatic transmission system exist at the present time. The first, an experimental installation operating at 66 kv., three-phase, was made in 1932 at the Plymouth Meeting substation of the Philadelphia Electric Company.

The second is an installation for single-phase, 132-kv. operation constructed by the Pennsylvania Railroad in connection with its electrification project at Baltimore, Md., and operating since January, 1935.




**Cables terminate in a manifold to give each a separate riser and pothead**

*Installation of the Philadelphia Electric Company at Plymouth Meeting Substation, Near Philadelphia*—This 2,000-ft. Oilostatic installation is in series with a 66-kv., 60-cycle aerial circuit between Plymouth Meeting and Philadelphia. The system consists of 1,600 ft. of three single-conductor, 1,000,000-circ.mil and about 400 ft. of three single-conductor, 750,000-circ. mil. Each conductor is covered with a 0.375-in. wall of oil-impregnated paper insulation, metal-shielding tape and canvas tape wrapping. These are in an 8-in. steel pipe equipped with three semi-stop joints and one straight joint for controlling the oil flow.

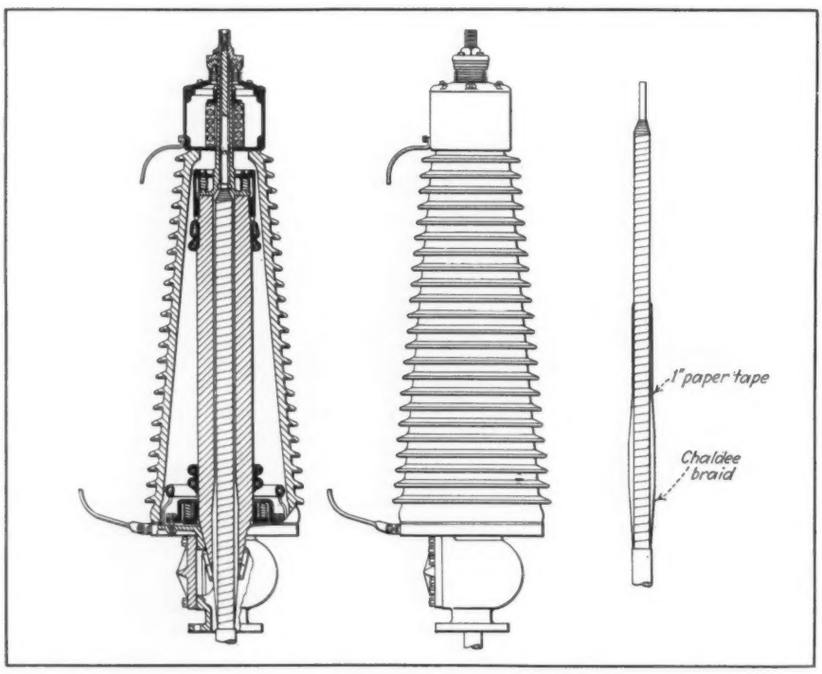
Except for brief intervals for inspection and minor adjustment this system has now been in successful continuous operation for more than three years without failure. The cable has been subjected to all the operating conditions occurring on a transmission circuit of major importance. In April, 1935, there occurred a peak load of 990 amp., 114,000 kva., which is approximately 115 per cent of manufacturer's load rating.

*Installation of the Pennsylvania Railroad at Baltimore, Md.*—The other installation of the Oilostatic transmission system was made by the Pennsylvania Railroad as sections of its 132-kv., single-phase transmission system, which extends from New York to Washington. This system is fed by a number of step-up transformers, each of which has its midpoint grounded through 330 ohms resistance. Except in Baltimore and Washington, this is an overhead system carried on towers along the railroad right-of-way. These overhead lines on the northerly side of Baltimore are directly connected to the Oilostatic transmission system extending for a distance of approximately 17,000 ft. through Baltimore in two feeders. At the southerly end they are again connected to the overhead lines.

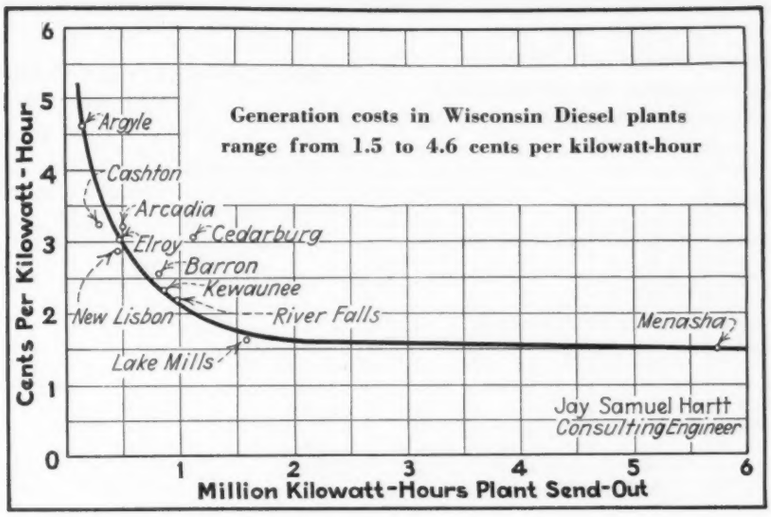
Each of these feeders is divided into two parts at the approximate midway point in a substation located in the Baltimore Terminal area. Each feeder consists of two 500,000-circ.mil concentrically stranded, single-conductor cables, insulated with impregnated paper to a thickness of 0.675 in. These two cables are installed in a 6½-in. I.D. mild steel pipe, ¼ in. thick. The potheads are designed for 161-kv., single-phase rating on this system. Operating oil pressure is 200 lb. per square inch at the oil house, which results in a pressure, due to static head, ranging from 180 to 200 lb. of the oil in the system.

One of the outstanding points in connection with this installation is the exceptionally long sections without splices in the tunnels. In the three tunnel sections, in order to obviate splices and expensive manhole construction, cable lengths up to 3,800 ft. were pulled.

This system has been in regular operation since January, 1935.




**Potheads are flange connected to cable**




Data are from the eleven plants enumerated in Tables I to III as abstracted from a report by Jay Samuel Hartt, who cautions that they should not be used promiscuously as a guide for determining Diesel costs in general unless applied in full recognition of the disclosed inadequacy of some of the plants to carry their peaks safely. The data are solely for the year 1934 and cover the items enumerated in Table IV.

# City Diesel Energy Costs Revealed

## Comprehensive Analysis of Authentic Wisconsin Data Reveals Production Costs and Distribution Expenses for Eleven Town Systems with Only Small Amount of Steam or Hydro

WISCONSIN'S municipal Diesel-electric plants sent out 13,024,370 kw.-hr. (Table II) to 9,163 customers during 1934 and the production cost was $143,800, including less than 5 per cent of hydro and steam generation. This means a weighted average of 1.21 cents per kilowatt-hour for eleven plants with a total of 9,950 installed Diesel horsepower, along with 840 of steam and hydro. Subsequent expenses of distribution (including administration, commercial and utilization) averaged to 0.57 cent (Table III) and taxes and depreciation added another 0.98 cent. Against these costs the revenue collected ran at the rate of 3.72 cents per kilowatt-hour.

These data emerge from an editorial analysis of comprehensive figures assembled in a survey of the Wisconsin municipal Diesel-electric plants made by Jay Samuel Hartt, consulting engineer, of Madison, Wis. The information compiled by him was taken primarily from the annual operating reports filed by the municipal utilities with the Public Service Commission of Wisconsin. Supplementary facts were obtained by inspections made at the respective plants.

During the past fifteen years fourteen municipals have installed Diesel-electric generating plants and the operating details of eleven of them, for which the data are quite complete, are given in the accompanying tables, abstracted from the Hartt report. Three of these plants (Argyle, Barron, River Falls) function in conjunction with hydro-electric equipment.

### *City accounting readjusted*

Some degree of segregation of costs as lumped by the municipal clerks was found necessary by Hartt. In fact, the essential data for each municipality are given twice in the report, once as reported to the Public Service Commission and again as adjusted by the investigator to render the data complete and comparable. To quote him: "The most troublesome difficulties were the inadequacy of accounting systems and of plant records. Utility records kept by part-time municipal clerks were usually inadequate." However, most of the adjustments made "were reapportionments, which did not affect the total costs of production."

All but 21 of the 256 pages of the comprehensive report are devoted to detailed presentation of the facts about the fourteen individual plants. History, operating schedules, purchased power costs, operating results, fixed capital, breakdowns, energy disposition, etc., are afforded in such detail as to lend substantiation to the economic significance of the operating statistics. Most of these utilities thus were found to compute their depreciation as a percentage of book value; the 1934 weighted average for thirteen of the plants was 4.493 per cent. Taxes were assigned in such manner as to produce a weighted average of 1.479 per cent.

### *Fuel and supplies cost in detail*

In spite of conflicting records on the cost of fuel oil, largely due to basing it in some cases on oil bought and in other cases on oil used, the data were capable of being reconciled well enough to establish (Table IV) an

## Table I—Land and Structures are Sizable Portion of General Investment in Wisconsin Municipal Diesels*

| Plant | Diesel Hp. Installed | Land | Structures | Generating Equipment | Total Plant | Investment Per Hp. | Distribution & Other Prop. Total | Distribution & Other Prop. Per Customer |
|---|---|---|---|---|---|---|---|---|
| Menasha | 3,600 | $2,963.74 | $27,691.09 | $286,206.90 | $316,861.73 | $88.02 | 265,277 | 96 |
| Lake Mills | 1,050 | 1,000.00 | 10,174.46 | 71,424.62 | (a)82,599.08 | 78.67 | 86,237 | 95 |
| Cedarburg | 1,200 | 240.00 | 19,279.31 | 109,608.95 | 129,128.26 | 107.61 | 97,383 | 97 |
| River Falls | 800 | 800.00 | 17,173.49 | 63,196.63 | (b)81,170.12 | 101.46 | 69,321 | 68 |
| Kewaunee | 600 | 2,240.00 | 10,090.12 | 56,800.82 | 69,130.94 | 115.22 | 68,220 | 93 |
| Barron | 1,080 | 425.00 | 7,872.17 | 83,346.16 | (c)91,643.33 | 94.85 | 46,327 | 25 |
| Arcadia | 600 | 475.00 | 9,500.00 | 52,626.44 | 62,601.44 | 104.34 | 32,979 | 50 |
| Elroy | 360 | 200.00 | 11,069.46 | 42,106.00 | 53,375.46 | 148.27 | 26,613 | 48 |
| New Lisbon | 300 | 200.00 | 6,000.00 | 41,903.52 | 48,103.52 | 160.34 | 24,633 | 66 |
| Cashton | 210 | 200.00 | 5,000.00 | 34,343.59 | 39,543.59 | 188.30 | 15,184 | 58 |
| Argyle | 150 | 70.00 | 1,841.00 | 17,000.00 | (d)18,911.00 | 126.07 | 16,549 | 64 |

*Data from extensive analysis by Jay Samuel Hartt, Madison, Wis.
Additional for steam or hydro capacity.
(a) Add $40,673 for steam boiler plant and building (engine and generator written off).
(b) Add 525 hp. with investment of $67,461.
(c) Add 240 hp. with investment of $103,778.
(d) Add 75 hp. with investment of $27,785.

## Table II—Average Kilowatt-Hour Sales of 1,321 for All Customers

| Plant | Kilowatt-Hours Plant Send Out: By Diesel Electric Plants | By Hydro or Steam Plants | Total | % Distribution Losses | Kilowatt Hour Sales | No. of Customers† | Kilowatt Hour Sales Per Customer |
|---|---|---|---|---|---|---|---|
| Menasha | 5,755,860 | ..... | 5,755,860 | 11.97 | 5,066,615 | 2,769 | 1,830 |
| Lake Mills | 1,590,506 | *3,128 | 1,587,378 | 13.54 | 1,372,452 | 909 | 1,510 |
| Cedarburg | 1,124,898 | ..... | 1,124,898 | 8.02 | 1,034,716 | 1,008 | 1,027 |
| River Falls | 966,038 | 349,550 | 1,315,588 | 12.12 | 1,156,192 | 1,024 | 1,129 |
| Kewaunee | 865,139 | ..... | 865,139 | 18.53 | 704,844 | 735 | 959 |
| Barron | 842,972 | 290,264 | 1,133,236 | 10.21 | 1,017,487 | 620 | 1,641 |
| Arcadia | 500,162 | ..... | 500,162 | 14.87 | 425,770 | 654 | 651 |
| Elroy | 479,700 | ..... | 479,700 | 19.07 | 388,239 | 550 | 706 |
| New Lisbon | 479,571 | ..... | 479,571 | 11.97 | 422,179 | 375 | 1,126 |
| Cashton | 288,194 | ..... | 288,194 | ..... | 288,423 | 261 | 1,105 |
| Argyle | 131,330 | 90,933 | 222,263 | 14.87 | 189,211 | 258 | 733 |
| Totals or averages | 13,024,370 | 727,619 | 13,751,989 | ..... | 12,066,128 | 9,163 | 1,321 |

*Station use with no generation. †Includes heating and cooking customers.

over-all average of 5.3 cents per gallon in 1934. The corresponding figure for lubricating oil was 52.77 cents per gallon. These items, along with those of supplies and operating labor, are embraced in Table V, which gives a percentage breakdown of the grand total of operating costs for all the plants. Fuel and lubricating oil absorb practically 30 per cent and the fixed charges 50 per cent of the over-all costs of generation. Labor and supplies represent the remaining 20 per cent for these plants.

### *Inadequate reserves carried*

Comment is frequently made on the tendency of municipal authorities to allow the loads to creep up beyond the point where their power plants are adequate to handle the peaks. The peak load carrying capacity for each plant was taken by Hartt to be the total kilowatt capacity of all generating equipment installed minus the rating of the largest unit, this on the assumption that the largest unit might fail or be unavailable because of overhaul at the time when the peak is experienced and the load would then have to be carried by the remaining units. On this basis only four of the plants were found to have an excess over the 1934 peak load and these excesses ranged only from 2 to 30 kw. in plants that had installed capacities

## Table III—Delivered Energy Costs 2.76 Cents for Wisconsin Municipal Diesel Plants

Over-all costs are for eleven plants which embrace less than 10 per cent of additional hydro or steam, generating about 5 per cent of the send-out.

| | Revenue Dollars: Total | Per Kw.-Hr. Sold | Per Customer | Per Dollar of Distribution Investment | Operating Expenses (Total Dollars; Cents per Kw.-Hr. Sold): Production Diesel, Hydro and Steam | | Distribution† | | Utilization | | Commercial | | General & Misc. | | Depreciation | | Taxes | | Total Expenses | | Operating Income: (Dollars) | (Per Cent Investment) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Menasha | 138,681 | 0.0274 | 50.08 | 0.523 | 43,558 | 0.86 | 13,189 | 0.26 | 2,292 | 0.05 | 1,943 | 0.04 | 7,324 | 0.14 | 22,208 | 0.44 | 10,210 | 0.20 | 100,724 | 1.99 | 37,957 | 6.52 |
| Lake Mills | 44,590 | 0.0325 | 49.05 | 0.517 | 18,174 | 1.33 | 2,864 | 0.21 | 569 | 0.04 | 580 | 0.04 | 3,051 | 0.22 | 9,106 | 0.66 | 1,078 | 0.08 | 35,422 | 2.58 | 9,168 | 4.38 |
| Cedarsburg | 52,014 | 0.0503 | 51.60 | 0.534 | 17,510 | 1.69 | 1,038 | 0.10 | 516 | 0.05 | 1,036 | 0.10 | 2,528 | 0.25 | 12,222 | 1.18 | 2,928 | 0.28 | 37,778 | 3.65 | 14,236 | 6.29 |
| River Falls | 46,749 | 0.0404 | 45.65 | 0.674 | 15,742 | 1.36 | 1,684 | 0.15 | 1,140 | 0.10 | 2,745 | 0.23 | 1,554 | 0.13 | 9,697 | 0.84 | 3,674 | 0.32 | 36,236 | 3.13 | 10,513 | 4.82 |
| Kewaunee | 36,192 | 0.0513 | 49.24 | 0.531 | 10,506 | 1.49 | 530 | 0.07 | 470 | 0.07 | 1,829 | 0.26 | 1,970 | 0.28 | 9,074 | 1.29 | 2,199 | 0.31 | 26,578 | 3.77 | 9,614 | 7.00 |
| Barron | 42,458 | 0.0417 | 68.48 | 0.916 | 10,766 | 1.06 | 3,121 | 0.31 | 403 | 0.04 | 1,363 | 0.13 | 1,681 | 0.17 | 12,102 | 1.19 | 5,022 | 0.49 | 34,458 | 3.39 | 8,000 | 3.31 |
| Arcadia | 20,958 | 0.0492 | 32.05 | 0.635 | 7,634 | 1.29 | 1,163 | 0.27 | 921 | 0.22 | 586 | 0.14 | 942 | 0.22 | 4,516 | 1.06 | 1,064 | 0.25 | 16,826 | 3.95 | 4,132 | 4.32 |
| Elroy | 21,358 | 0.0550 | 38.83 | 0.803 | 6,929 | 1.78 | 2,055 | 0.53 | 155 | 0.04 | 259 | 0.07 | 1,761 | 0.45 | 3,999 | 1.03 | 1,280 | 0.33 | 16,438 | 4.23 | 4,920 | 6.15 |
| New Lisbon | 21,711 | 0.0514 | 57.90 | 0.881 | 6,810 | 1.61 | 573 | 0.14 | 507 | 0.12 | 186 | 0.04 | 1,937 | 0.46 | 1,200 | 0.28 | 500 | 0.12 | 11,713 | 2.77 | 9,998 | 13.75 |
| Cashton | 13,222 | 0.0458 | 50.66 | 0.871 | 4,072 | 1.41 | 624 | 0.22 | 155 | 0.05 | 129 | 0.04 | 863 | 0.30 | 3,163 | 1.10 | 726 | 0.25 | 9,732 | 3.37 | 3,490 | 6.38 |
| Argyle | 11,395 | 0.0602 | 44.17 | 0.689 | 4,099 | 2.16 | ..... | ..... | 206 | 0.11 | 223 | 0.12 | 269 | 0.14 | 1,979 | 1.05 | 871 | 0.46 | 7,647 | 4.04 | 3,748 | 5.93 |
| Total or weighted average | 449,328 | 0.0372 | 49.18 | 0.600 | 145,800 | 1.21 | 26,841 | 0.22 | 7,334 | 0.06 | 10,879 | 0.09 | 23,880 | 0.20 | 89,266 | 0.74 | 29,552 | 0.24 | 333,552 | 2.76 | 115,776 | 5.84 |

*Includes production costs transferred to water department for energy consumed there. †Includes in some instances transmission and conversion.

**Interest in competitive Diesel energy costs never sags. Here are data assembled by Jay Samuel Hartt from official sources in Wisconsin. They show that it costs 12 mills to generate 95 per cent of the output in Diesel plants ranging from 150 to 3,000 hp. with investments running from $78 to $188 per horsepower (Table I). More complete analysis has hardly ever been made available than that condensed here. It should help to settle the argument about where Diesels do and do not fit.**

between 141 and 883 kw. Ten of the plants had deficits in capacity ranging from 37 to 169 kw., the latter being for the largest plant (Menasha) with 2,417 kw.

As for maintenance, there was less volume of data available because that item is included in the cost of supplies and expenses for all but the larger utilities, which are required to report to the commission. It was capable of segregation therefore in only two of these Diesel plants. For Menasha it was found to be $1.32 per horsepower per year over an eleven-year period. This amounts to 0.09 cent per kilowatt-hour of plant sent out. For the Cedarburg plant the three-year averages were found to be $2.60 and 0.299 cent, respectively.

### *Fuel and lubrication costs detailed*

Kilowatt-hours generated per gallon of fuel oil ranged from 10.97 for the largest plant to 7.75 for one that was not, however, the smallest. Figures for lubricating oil were much less consistent, ranging from 241 kw.-hr. per gallon for the smallest plant to 1,076 for Barron, which had about one-seventh the send-out of Menasha, the largest. For Menasha the figure was 564 on lubricating oil. Cooling water figures in gallons per kilowatt-hour generated were as follows for 1934: Menasha, 11.22; Barron and Arcadia, 10; Elroy and New Lisbon, 1.75; Argyle, 0.41.

Incidental to the generation data is considerable information about the book value of distribution systems. Altogether eleven of these municipals have distribution systems which amount on the books to $717,354 to serve the 9,163 customers, or an average of $78.50 per customer. Revenues are such as to bring in annually about $0.60 for each dollar invested in distribution facilities. By comparison the average Diesel plant investment of $130 per horsepower amounts to $141 per customer. These proportions of distribution and generation investment are quite the reverse of the figures for larger communities knit together into systems extensive enough to support plants with large turbo-alternators. Of course, there is no appreciable amount of underground distribution in these communites to bring the distribution cost per customer to the much higher figures pertaining where underground construction is prescribed and numerous substations are required to effect the distribution of energy.

## Table V — Generation Cost Breakdown Shows Fixed and Operating Charges Equal

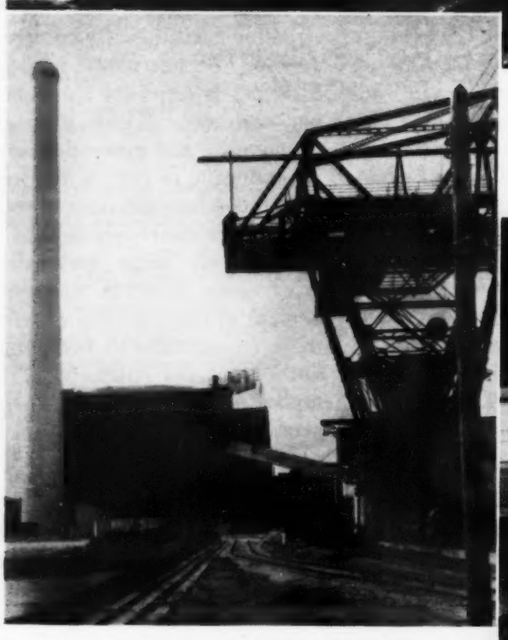
| | Per Cent | | Per Cent |
|---|---|---|---|
| Labor,. ..... | 14.4 | Insurance on plant..... | 1 0 |
| Fuel oil..... | 25.5 | Compensation insurance . | 1.0 |
| Lubricating oil. | 4.3 | Taxes at 2% of investment | 7.4 |
| Supplies and expenses, incl., mtce..... | 4.8 | Depreciation at 5% of investment..... | 18.5 |
| Cooling water.. | 0.9 | Interest at 6% of investment..... | 22.2 |
| | 49.9 | | 100 0 |

## Table IV—Wisconsin-Municipal Diesel Generating Plant Statistics for 1934

| | Menasha | Lake Mills | Cedarburg | River Falls | Kewaunee | Barron | Arcadia | Elroy | New Lisbon | Cashton | Argyle |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Kw.-hrs generated (hydro power) | ..... | ..... | ..... | 354,550 | ..... | 291,466 | ..... | ..... | ..... | ..... | 95,380 |
| Kw.-hrs. station use | ..... | ..... | ..... | (a)5,000 | ..... | (a)1,202 | ..... | ..... | ..... | ..... | (a)4,447 |
| Per cent station use | ..... | ..... | ..... | 1.41 | ..... | 0.41 | ..... | ..... | ..... | ..... | 4.66 |
| Kw.-hrs. generated (oil-engine) | 5,867,750 | 1,672,200 | 1,196,700 | 1,027,700 | 936,200 | 854,336 | 505,500 | 541,750 | 541,000 | 319,400 | 139,740 |
| Kw.-hrs. station use | 111,890 | 81,694 | (a)71,802 | (a)61,662 | 71,061 | (a)11,364 | (a)5,338 | (a)62,050 | 61,429 | (a)31,206 | (a)8,410 |
| Per cent station use | 1.91 | 4.89 | 6.00 | 6.00 | 7.59 | 1.33 | 1.06 | 11.45 | 11.35 | 9.77 | 6.02 |
| Kilowatt peak load on plant | 1,780 | 495 | 300 | 450 | 304 | 450 | 200 | 148 | 130 | 90 | 125 |
| Annual load factor | 39.18 | 38.56 | 45.54 | 35.06 | 35.16 | 30.76 | 28.85 | 41.79 | 47.51 | 40.51 | 21.47 |
| Gallons of fuel oil used | 534,776 | 144,520 | 134,110 | 98,600 | 104,330 | 98,279 | (a)65,144 | 59,553 | 52,680 | 30,699 | 23,740 |
| Gallons of lubricating oil used | 10,397 | 2,722 | (a)1,222 | 1,472 | 1,831 | 794 | 1,870 | 1,004 | 1,167 | 1,133 | 580 |
| M gallons of cooling water used from mains | 65,829 | ..... | ..... | ..... | (b)10,000 | (a)8,543 | (a)5,055 | (a)948 | (a)947 | ..... | 57 |
| Fuel oil cost in cents per gallon | 4.91 | 5.51 | 5.37 | 4.77 | 5.63 | 4.68 | 5.43 | 4.21 | 5.90 | 4.90 | 5.46 |
| Lubricating oil cost in cents per gallon | 40.30 | 48.40 | (a)50.00 | 60.90 | 60.70 | 60.70 | 46.20 | (a)61.71 | 58.00 | 50.50 | 50.00 |
| Cooling water cost in cents per M gallon | 2.02 | ..... | ..... | ..... | 1.50 | 5.47 | 2.75 | 4.00 | 1.25 | ..... | 29.84 |
| Specific gravity of fuel oil | 24-30 | 28-32 | 24-26 | 32-36 | 32-36 | ..... | 32-36 | 28-36 | 32-36 | 28-32 | 38-40 |
| Kw.-hrs. generated per gallon of fuel oil | 10.97 | 11.57 | 8.92 | 10.42 | 8.97 | 8.69 | 7.76 | 9.10 | 10.27 | 10.41 | 5.89 |
| Kw.-hrs generated per gallon of lubricating oil | 564 | 614 | 979 | 698 | 511 | 1,076 | 270 | 540 | 464 | 282 | 241 |
| Gallons of cooling water per kw.-hr. generated | 11.22 | ..... | ..... | ..... | ..... | 10 | 10 | 1.75 | 1.75 | ..... | 0.41 |
| Running plant capacity factor | 67.26 | 57.52 | 38.98 | 50.70 | 53.39 | 44.89 | ..... | 49.22 | 59.84 | 49.74 | 29.21 |
| Kw.-hrs. generated per horsepower installed | 1,630 | 1,593 | 997 | 1,285 | 1,560 | 791 | 842 | 1,505 | 1,083 | 1,521 | 903 |

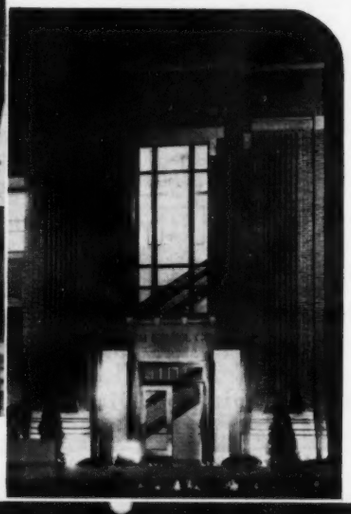
(a)-Estimated. (b)-For four months only.

# Port Washington in Operation

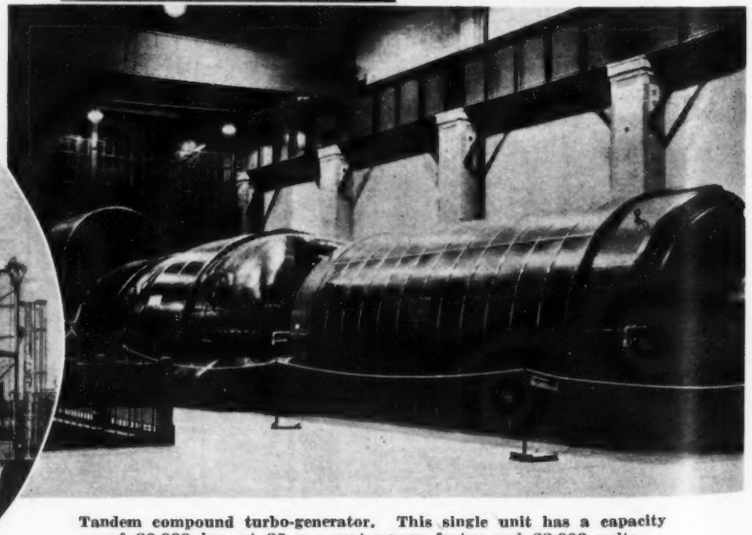


Inland end of the coal bridge. This bridge carries a 10-ton bucket and handles 600 tons of coal an hour. Storage capacity of the coal dock is 330,000 tons

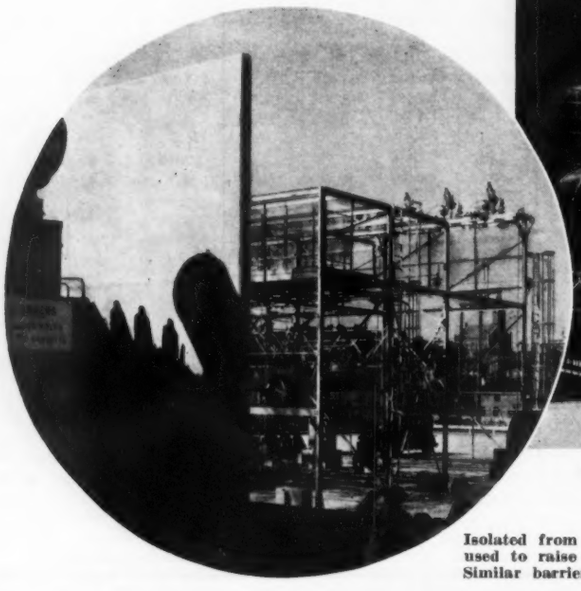
Entrance to plant office



AT PORT WASHINGTON, on Lake Michigan, about 30 miles north of Milwaukee, is the new 80,000-kw. steam station of the Milwaukee Electric Railway & Light Company, which went into operation October 14, 1935. Built at a total cost of $7,684,000, the station houses a single unit using steam at 1,230 lb. pressure and a temperature of 825 deg. F. Energy is generated at 22,000 volts and is stepped up to 132,000 volts for transmission throughout the system. When fully developed the station will have an ultimate capacity of 400,000 kw.



Tandem compound turbo-generator. This single unit has a capacity of 80,000 kw. at 85 per cent power factor and 22,000 volts



Isolated from plant substation by a barrier are the power transformers used to raise the 22-kv. generator output to 132 kv. for transmission. Similar barriers between individual transformers

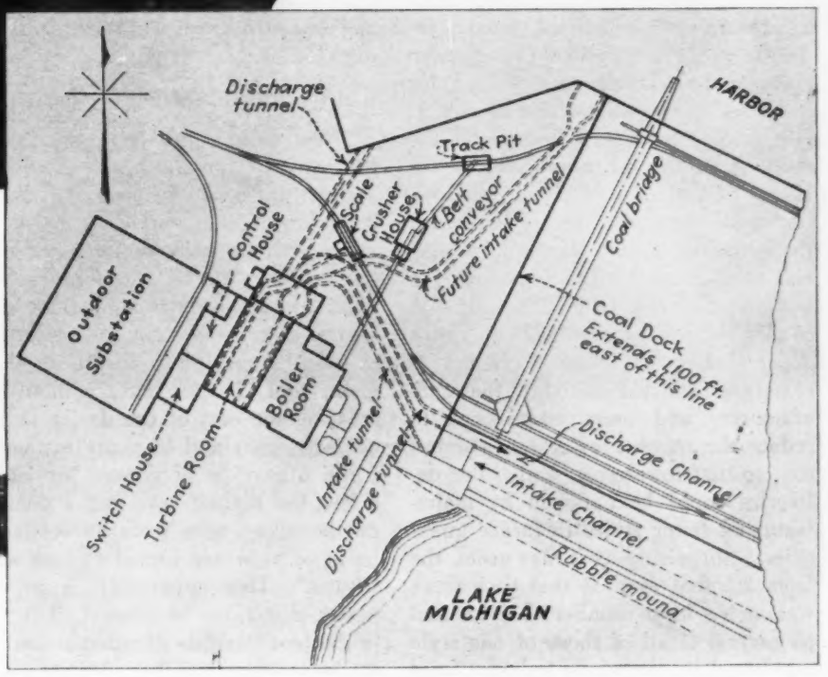
**Built Progressively During Six Years, This Unit Type, High-Pressure Steam Station on Lake Michigan Was Recently Put in Operation**

Take-off for the 132-kv. transmission line carrying Port Washington power. Most of the station output goes to Milwaukee

**COST OF THE STATION** is approximately $96.05 per kilowatt. This covers the first unit, and in addition includes many costs, such as plant site, coal dock with its rubble mound protection, railroad tracks, coal-handling facilities and condensing water tunnels, that can be allocated to future extensions because these costs will not recur as capacity is added. When Port Washington is developed to its contemplated capacity of 400,000 kw. the unit cost will be down to a value that may startle some designers.

*Photos by S. I. Rockwitz, illuminating engineer in the sales department of M. E. Rwy. & L. Co.*

The oldest building in Port Washington, a stone house built 87 years ago from stones picked up on the shore of Lake Michigan, now serves as the gate house of the new plant




Coal dock serves as barrier between intake and discharge tunnels

# Burnham on Switchgear Grading

An Interview by
H. S. KNOWLTON

A GREAT deal of thought is being given by the electrical industry just now to the development of future markets for service. All branches of the industry need to work for this objective in order to meet the challenge of the times. Reasonable prosperity cannot be achieved in the years immediately ahead without an expansion in the use of electricity on virtually all fronts. Having heard George A. Burnham remark that today's Condit catalogue of circuit-breaking devices contains virtually no apparatus duplicating that illustrated in the same publication three years ago, and knowing his proclivity for weighing the economic significance of manufacturing conditions in relation to business development, I asked him to outline his views on the influence of the designing engineer in the switchgear field upon the growth of electrical service.

"What is the underlying reason for so marked a development in circuit-breaking devices in so short a time?" Mr. Burnham was asked. "Basically," he replied, "it is a result of the depression. In practically every field, manufacturers of electrical, and, indeed, of other devices, have been stimulated to greater competition for business. New designs have been vital factors in securing patronage at the reduced volume of purchasing available. In the circuit breaker field custom-made products have dominated the situation largely through the special requirements of the customers in adapting the so-called 'standard unit' to their particular needs. Prior to the depression, when values were not as closely scrutinized as today, the manufacturers and users endeavored to reduce the number of styles, gadgets, etc., so that lower costs and better deliveries could be obtained by manufacturing fewer styles in larger quantities. Surprising as it may seem, the facts are that even at that time there was such a large number of styles that in general if all of those of one style purchased by the whole industry were made by one manufacturer it would not be of sufficient magnitude to indicate any lower costs as a result of quantity production.

"During the depression there was an opportunity for the manufacturers to improve their products, based on the experience gained through their research and testing laboratories, but instead of being improvements, it was in reality the scrapping of the designs of two or three years ago and the bringing out of actually new designs, and as a result the manufacturer, whether he liked it or not, is in a position where he is forced to supply the older products of three or four years ago and in addition the up-to-the-minute line of today. With the art in such a state of flux, little can be looked for in the immediate future in the way of reducing costs through manufacturing in greater quantities."

"Mr. Burnham," I asked, "do you consider these multitudinous changes to be a satisfactory basis for business expansion, now that revenues of utility and industrial companies are improving?"

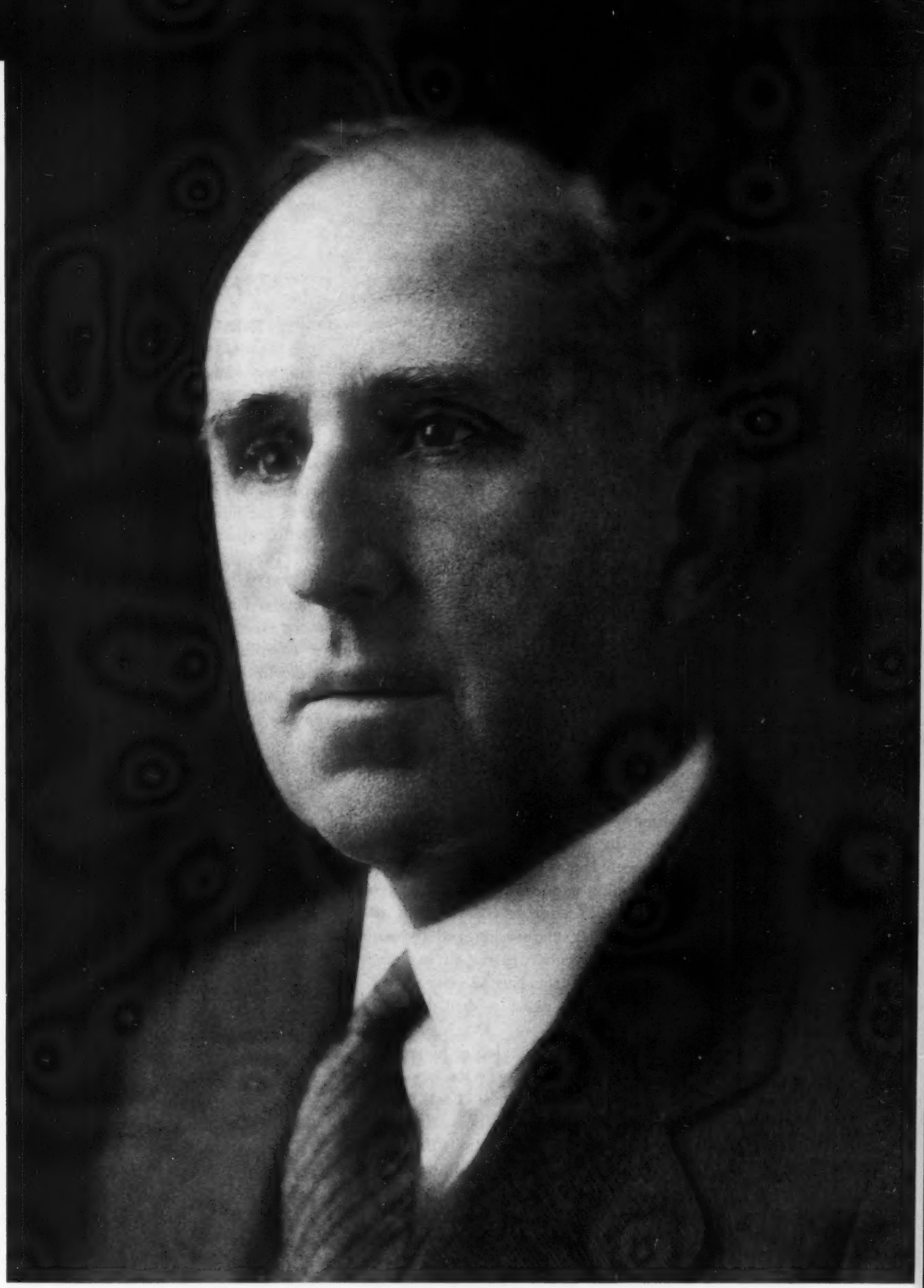
### *Advocates simplified switchgear*

"New designs are appealing," was the answer, "but the brake should be applied by some governing body or committee whose duty it is to determine whether such designs are economically justified. Development has been so rapid and the competitive race so fast that few designs at present are in use long enough to absorb development, tool charges, etc., without increasing the cost of the device to the ultimate user, and in many instances, while it may be of greater service to a few, the highest costs put a penalty on the many, who from an economic point of view are forced to seek substitutes. This apparently is in the wrong direction; in general, it is not in the best interests of either manufacturers or users and has a tendency to lower service standards. The user and the manufacturer ought to have a 'breathing spell.' In my opinion, it would be well to study the possibilities of greater simplication and the field for what might be called switchgear grading for specific classes of service. By grading I do not mean rating, but a closer adaptation of dollar values in breaker investment and operation to defined requirements."

Requested to explain, Mr. Burnham said: "I have become convinced that the importance of the service to be given should count much more in breaker design. Right now manufacturers are supplying breakers to many uses which are undoubtedly better than conditions really dictate. In the field of heavy power service, in major interconnections, in large generating plants and in extensive industrial applications we of course need the maximum skill of the designer and manufacturer. Here cost is relatively unimportant when balanced against service reliability. In this class, where applications are so relatively few in number and of such great importance to the continuity of service, controlling and protecting the main artery of our distribution system, operating statistics seem to indicate that better mechanical construction should be the aim of our designers. This class, which requires the maximum of reliability, would undoubtedly justify the additional cost of the better mechanical design. Outside this realm, as in rural electrification, in numerous small industries and on less important utility systems I question if we need apparatus with multiplied refinements, so many automatic features, and such a reserve in ruggedness as is required on these important centers of our distribution system. Already a start has been made in grading transformers and some other equipment for farm service into a lower cost (increased value per investment dollar) level.

"We don't need a dress suit in which to go fishing. There is a close relationship between greater apparatus value per dollar and increasing use of

[*Continued on page 91*]



**GEORGE A. BURNHAM, president of the Condit Electrical Manufacturing Corporation, Boston, and an outstanding figure in the circuit breaker field, suggests a provocative solution to a major apparatus marketing problem.**

# ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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## *Edwin Wilbur Rice, Jr.*

FEW men have had the career and made the contributions of E. W. Rice, Jr., although these have not been publicized and dramatized to any extent. For fifty-six years this electrical pioneer has gone about his work modestly and quietly, and yet his influence and contributions rank him as an outstanding leader in the industry he served. In fact, the record shows that Mr. Rice, as executive, engineer and inventor, contributed to industry progress as much as if not more than any other individual.

Under the stimulus of Elihu Thomson, Mr. Rice developed expertness in invention and research and gained that deep knowledge of the value of research that made him the leading exponent and supporter of research in the industry. Yet his business ability was such that he reluctantly left engineering and research and embarked upon his executive career in manufacturing, where he made an outstanding success as technical director, works manager, vice-president and chief executive.

Those who knew Mr. Rice marveled at his ability, patience, modesty and understanding. He organized men and stimulated them to their greatest efforts quietly and effectively. While keeping himself in the background, he contributed ideas and suggestions that were logical and constructive. His range of interest was wide, yet he always had the imagination and vision to look ahead and plan ahead with the utmost faith in the future possibilities of the industry. His support and encouragement of research workers and engineers were effective and ardent and he was in a position to get the money and perfect the organizations to carry out his plans, even though these involved daring departures in business practice. Mr. Rice was interested in men and in new ideas and at the same time ably guided the destinies of one of the largest business corporations in this country in a time of rapid expansion in business volume and technical developments.

One by one the electrical pioneers pass on, but it is to be hoped that such names as E. W. Rice will never fade as a symbol of progress and accomplishment to stimulate electrical men to carry on with the same practical faith and enthusiastic vision.

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## *A Market But No Product*

ALL INDUSTRIAL plants are busy planning remodeling operations to improve their status. This usually means more electrification and need for more capacity. Where will it come from? Alert utilities will go after this market intelligently and increase their present wholesale business, but they, too, will need to add capacity to serve the loads. This period is wide open to a factory-built unit power station that could serve the industrials and yet tie into the utility system. The cheapest capacity is that installed at the load.

Process steam requirements of the industrials as well as power requirements might be satisfied if a self-contained and almost semi-portable power station unit were available. A boiler-turbine generator designed as a complete unit is readily visualized and would fit splendidly into the present capacity specification for both utilities and industrials. It is bound to come forth in the future.

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## *Value of Small Hydros in Utility Systems*

THE pendulum of engineering opinion has lately swung so far toward fuel-burning plants as exemplars of base load economy that the value of small hydro plants is sometimes overlooked. Data covering a year's operation of two such stations on an Eastern system with an urban nucleus of business illustrate the usefulness of such installations under good operating conditions. The company's main steam plant, a 55,000-kva. installation on a large river front in the heart of the city, was held in reserve throughout the year, except during one month, when 285,000 kw.-hr. was generated there. The bulk of the energy supply, 97,500,000 kw.-hr., was purchased from a power pool at 1.2 cents per kilowatt-hour. A few miles from the city the company's two hydros (800 and 6,125 kva.) produced 25,700,000 kw.-hr. In other words, about 21 per cent of the total energy delivered to the buses came from 11 per cent of the company's own generating capacity, and the ratio of hydro average load to hydro plant rating was 42.5 per cent.

The company saved money by buying energy from the pool instead of running its local steam plant, but the operating cost of energy delivered from its two small hydros was only 4.6 mills per kilowatt-hour, and this included a payment of more than $85,000 for water-usage rights. A complete analysis of costs, including the expense of modernizing the small hydros a few years ago, would doubtless narrow the spread between

pool energy costs and local over-all expenses at the hydros. The company is well satisfied, however, with its development of these small stations as supplements to its other facilities, and the amount of energy which these contributed to the system is somewhat surprising. Such a case does not, of course, prove the wisdom of embarking on a widespread program of development of hydro-electric facilities of moderate rating, but in view of the growth of utility outputs in many parts of the country and prospective demand for increased generating capacity resulting, the time is ripe to examine such possibilities from an improved economic position. In fact, a decided stir toward modernization of existing hydros is already apparent in the Northeast.

The holding back of such developments on the ground that it may cost too much to improve plants built many years ago under lower price levels should not be used as an excuse for inaction when engineering investigation reveals the wisdom of modernization or of new construction. In the case noted above, both stations have a capital cost increased considerably by improvements subsequent to their original construction, but apparently the money has been well invested when considered from the standpoint of intensive use of the funds required.

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## *Oil Pipe Line Transmission*

AN EPOCH-MAKING development in transmission is described in this issue. The use of a pipe filled with oil under pressure and containing an electric conductor is a logical step forward in the recent trend in underground cable. Such a system was a suggestion in an ELECTRICAL WORLD editorial some years ago. Now it is a practical installation in Baltimore and Philadelphia for high-voltage transmission.

This new development leads to speculation on its extension and improvement. With load densities in large cities expected to be many times their present values in coming years and with increased service continuity demanded, it may be that a completely new underground pressure-dielectric cable system, with transformers and switches inclosed and under pressure also, will be the economical and practical development in the future to carry the loads in the congested streets.

With the high cost of high-voltage overhead transmission systems, particularly near metropolitan centers; their exposure hazards, and the possible use of high-voltage direct current, it may be that here again the underground pressure-dielectric cable system will find a major place. These happenings are not to be expected in a day, but already several useful fields of application for the system in its present form are available.

In our opinion research should be directed in an endeavor to find a dielectric superior to oil and toward finding a container superior to metal pipe. Oil is a splendid dielectric, but the future may bring us a synthetic dielectric that is inexpensive and that will not burn or explode. Metal pipe for underground use has some disadvantages because of its corrosive characteristics, even though protective coverings are used. Research may answer this problem also.

This engineering innovation is one more momentous research development that establishes the fact that electrical men are active and that current problems are solved by new engineering feats. The ultimate future of this system is yet to be determined, but it rates now as the outstanding development in transmission in many years. Those who created and used the new system have made a most significant contribution to industry progress.

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## *The Best Customer of Them All*

WHEN an industrial customer comes to town the power company steps right out. A salesman calls and offers advice and help. An engineer will check his plans and equipment for motors and control. Here is a worth-while piece of business—maybe 10,000 or 50,000 kw.-hr. a year—though at the lowest rate. It is taken care of.

Down the street from the utility's office is an appliance dealer. He may sell 50 refrigerators in a year. That means 30,000 kw.-hr. at a higher rate. He might sell twenty ranges—or 30,000 kw.-hr. more. He might sell 25 ironers and hundreds of small appliances. He already produces more revenue for the power company than that new factory. He can become a much greater creator of load. But too frequently nobody ever goes near him, and it doesn't make sense.

In a recent example, a dealer who has sold 120 refrigerators so far this year admitted that he does not know the sales manager of the local utility. He knows the salesman who "covers" him, but the sales manager himself has never called. And this is by no means unbelievable. It is not general, for in most cities there is a friendly contact, but it occurs in enough places to be entirely credible. Yet such a dealer produces new revenue continuously and is worth developing.

Every power company has on its staff men trained in accounting, advertising, sales and engineering who can help build better dealers. How to keep a set of books and know costs, how to buy and keep stock, how to dress windows, how to train salesmen, how to service customers—these are the problems that beset the dealers. It would pay the utility to have one of its men schooled in each specialty, to conduct each year a co-operative course of training for dealers, so that the net volume of appliances sold onto the lines may be steadily increased. For every good dealer is an asset as valuable as the good commercial or industrial customer to whom special service is gladly extended.

The study of the methods of sixteen power companies in load building with small appliances in this

issue gives a sharp point to this argument. Here is a line of merchandise accepted by the public for its convenience and utility. It has real load value in the aggregate and is vital to a balanced domestic service. Yet more could be done by these sixteen outstanding utilities to help these dealers prosper, grow and put more appliances in use. It is an opportunity that has been too long neglected throughout the industry. For in terms of revenue a good dealer is the best customer of them all.

# • TRENDS •

THE EDITORS USE A SPOTLIGHT ON CURRENT HAPPENINGS

## Middle West Clearing Decks

THE latest of the many plans for Middle West Utilities meets the approval of all interests except Judge Wilkerson, who thinks the former stockholders should have a greater share in prospective prosperity after the reorganization. The latest plan promises to be accepted, and if so, this will finish the reorganization. Middle West will become a self-sustaining $60,000,000 utility corporation instead of the old empire four times this size. Many of its properties have been joined to new owners and managers. Incidentally, the patience and ability of D. C. Green have been invaluable in making it possible to clean up the Middle West situation this year.

## 56,000,000 Radio Sets

NEARLY half the radio sets in the world are in use in the United States. "Radio Markets" for November 6, published by the Electrical Division, Department of Commerce, gives statistics for the various countries. The grand total is about 56,200,000 sets; of these 25,550,000 are in the United States. All the European countries, exclusive of Russia, have 22,900,000. It may be noted that these devices contribute very appreciably to the central-station load. On the usual assumptions as to average energy use, the annual consumption of those in the United States, excluding battery-operated sets, is around 1,000,000,000 kw.-hr.

## Private Enterprise Best for Labor

SPEAKING of the future of utilities and likening it to what has already befallen the railroads, which now apparently have no other destiny than complete government ownership, Phil S. Hanna, editor *Chicago Journal of Commerce*, said recently to the Wisconsin Utilities Association: "If this comes it will be a sorry day, not only for the politicians in the railroad unions, but a still sorrier day for the railroad workers. Governments have a way of abolishing unions when government ownership is established. The unions in France and Germany have had their treasuries confiscated and their powers and privileges abolished. If and when government ownership of the rails takes place, some will recall, much too late, Samuel Gompers' sage advice to the effect that it is much easier to bargain with a private employer than with a politician."

## Unit Transmission Costs

FIGURES announced in connection with the awarding of contracts for the 237-mile, 230-kv. transmission line from Boulder Dam to the pumping plants of the Colorado River aqueduct, by the Metropolitan Water District of Southern California, indicate an average cost of $9,570 per mile. Some of the unit costs, per mile, were as follows: Aluminum, conductor and appurtenances (227 miles) $2,700; copper conductor and appurtenances (10 miles), $3,725; steel (237 miles), $1,700; construction (237 miles), $1,720. This shows where material and labor costs are now for favorable conditions of territory.

## An Electrical Christmas

AN INTERESTING sidelight on Christmas is the growing appreciation of the public for electrical presents and uses during Yuletide. The glowing lights on trees in the yards and homes are but part of the story. Interior decorative light is growing in use. Presents ranging from electrical toys through appliances to decorative art objects are in growing demand. This is a particularly good year to build up good will and business at the holiday season. The public has money and is receptive to electrical sales.

## England Wiring Up

OUT of 11,336,376 homes in Great Britain 6,073,706 are now wired—53 per cent. More than a million are d.c., the balance a.c. Some 1,763,985 have been wired since 1932. Last year 680,906 were added. England is speeding up electrically. These figures are from surveys conducted by *Electrical Trading*, an English publication. There are no official figures.

## Air Conditioning by Decree

BRAZIL is going in for the more abundant life. According to a report received by the Department of Commerce, a decree is shortly to be issued by the Government of the Federal District (city of Rio de Janeiro and environs) requiring all motion-picture houses located within a stipulated radius of the city's main business district to install air-conditioning equipment within a stipulated period. Improved climate in public buildings and in homes will be a logical sequel.

## Tax Subsidy for Farms

WHY should the federally financed rural power line be exempt from taxation while the privately constructed project is taxed? Suiting the action to the word, W. G. Grant, Chester county representative in the South Carolina Assembly, promises to submit legislation at the next session to exempt private service to the farmers of the state. "I just feel that they should be treated alike," says Assemblyman Grant.

# Long Court Battle Looms as Largest Utilities Sue

**Leaders reiterate approval of sound federal regulation, but deplore destructive law — 331 seek exemption, with 50, including eleven biggest systems, seek to enjoin S.E.C. control**

More than 50 public utility companies are suing to enjoin the S.E.C. from enforcing the holding company law, practically all of the large systems in one way or another are lined up against the statute, and the question now becomes one of how long the litigation will drag along. For, upon that factor, in the belief of many both in and out of the industry, hangs an important phase of business recovery. In other words, will or can the utilities make the large needed expenditures for expansion and improvement which promise material aid to the heavy industries?

The utilities, obviously, are not worried about the outcome of the far-flung court battle. Nevertheless, there are none who doubt that some form of federal regulation is inevitable and there is no great disposition to go ahead until the situation is ironed out. Yet there is a strong barrier to rushing the court tests to a decision, namely: Why should the utilities seek the decision in a Presidential election year and, moreover, why should they press for a verdict pointing out the vulnerable spots in the law while Congress is in session to remedy these weaknesses? The S.E.C. feels the court battle may drag for a year or more.

### *Sound regulation desired*

There can be no doubt that the utility industry was as anxious to avoid this impasse as the government. So it is that three leading executives—Wendell L. Willkie of Commonwealth & Southern, John J. O'Brien of Standard Gas & Electric and J. F. Fogarty of North American—all pointed out in their letters to stockholders announcing the intention of seeking injunctions against the S.E.C. that such action was not taken antagonistically, but for the protection of stockholders from a piece of destructive legislation. All three reiterate their desire for sound federal regulation.

Mr. Fogarty, explaining North American's suit, said:

"The situation does not permit delay. The 'death sentence', while itself deferred, constitutes a present and serious obstacle to the proper conduct of our company's affairs. No enterprise of magnitude can be properly directed without basic policies which look to the future. If, as the act prescribes, our present enterprise is to be eliminated, then wholly different policies are in the interval required than those which are appropriate if the enterprise is to be continued."

The company, he continued, has for many years made it a practice to build up and strengthen its operating utilities "so that they may supply more power at low cost to the public." He asserted that during the last ten years the company's investments in and plowed-back earnings of subsidiaries exceeded $130,000,000.

"We cannot now see," Mr. Fogarty said, "how the act can be made workable or how it can be administered without paralysis and disintegration of our business. This is, indeed, the intended result . . . . and we cannot abdicate in favor of a commission which is required to apply measures which are deliberately destructive, at the behest of an act of Congress which counsel advise is unconstitutional."

As the matter stands now, the situation lines up as follows: (1) The Baltimore test case has gone to the U. S. Circuit Court of Appeals. (2) The S.E.C. has sued Electric Bond & Share and five major subsidiaries to force them to conform to the law, and Bond & Share has retaliated by realigning executive personnel. (3) The government has won partial verdicts in two suits, in one of which the utility was told to register but not to waive constitutional rights, and in both the federal judges refused to rule on the constitutionality of the law. (4) A total of 331 companies are asking exemption, mostly on intrastate grounds. (5) About 50, including eleven of the largest systems, are seeking to enjoin enforcement. (6) Sixty, including three large systems, have registered, one claiming duress. (These 60 represent almost 600 subsidiaries.) (7) Six are taking no action (four of them are distinctly intrastate). (8) Three important systems have been enjoined from registering by stockholders.

Here is how the major companies line up:

*Seeking injunctions*

American Water Works & Electric.
Associated Gas & Electric (although the company planned to register until the last minute).
Cities Service.
Commonwealth & Southern.
Consolidated Gas of New York.
North American.
Standard Gas & Electric.
Stone & Webster.
United Corporation.
United Gas Improvement.
United Light & Power.

*Seeking exemption*

Public Service of New Jersey.
Peoples Gas Light & Coke.
Commonwealth Edison.
Long Island Lighting.
Pacific Gas & Electric.
Public Service of Northern Illinois.
Pacific Lighting.
Consolidated Gas of Baltimore.
Philadelphia Company.
Metropolitan Edison.
Pacific Public Service.

*Registering*

New England Power Association and 55 subsidiaries.
Middle West Corp. and 102 subsidiaries.
New England Public Service.

*Taking no action*

Niagara Hudson Power.
American & Foreign Power.
Edison Electric Illuminating of Boston.
Detroit Edison.
Midland United.
Southern California Edison.

*Restrained by stockholders*

Utilities Power & Light (which had announced the intention of registering).
Central Public Utility Corp.
Columbia Gas & Electric.

The steps taken by many of these companies and their reasons are interesting. Consolidated Gas of New York, though intrastate, declared it had been advised by counsel that the law does not expressly exempt intrastate holding companies, and, as any exemption could be revoked at will, it had decided to test the validity of the law. At the same time it moved to absorb four subsidiaries, Astoria Light, Heat & Power, Queens Gas, Central Union Gas and Northern Union Gas.

When New England Power Association registered it was announced that International Hydro-Electric system had relinquished voting control to three trustees; International Hydro and its parent company, International Paper & Power, sought exemption on the grounds that they no longer are utilities, and the

ties between the directorates were severed.

American Water Works, although it sued to prevent application of the law to its system, applied for registration of three subsidiaries, West Penn Power Company, Monongahela West Penn Public Service Company and the Potomac Edison Company, explaining such action was necessary to "enable these companies to go forward with their plans for financing and for construction which will become necessary if the present rate of power output is maintained."

Mr. Willkie deplored the fact that Commonwealth & Southern could not see its way clear to register, but minimized the danger of the utilities offending the government. He declared: "The almost unbelievably unfair attack on this industry by the governmental agencies and officials who are also sponsoring the heavily subsidized Tennessee Valley Authority program and who are spurring municipalities by outright gifts of 45 per cent of the cost of distribution systems to duplicate and compete with our systems, leaves us with little hope that we could obtain the good will of these governmental agencies no matter what course we took with reference to registration."

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## Rush of New Bonds Halts Precipitately

The recent rush of public utility bond issues came to a precipitate halt at the end of November, with the outlook for further refunding or new capital operations in this field anything but clear. With November's feverish activity obviously aimed at public offering of all the deals which had been authorized in Washington, attention now focuses on what attitude the S.E.C. may take toward financing of companies (and their subsidiaries) which refused to register.

Investment bankers are pondering several questions of significance, such as: To what extent may the S.E.C. be offended by the refusals to comply? Can the S.E.C. properly hold up the financing of wholly or largely intrastate subsidiaries of non-registrant holding companies? Would the S.E.C. hold up such issues if they contemplated raising new capital to expand in meeting the soaring electrical power load, such expansion being an important item in carrying on business recovery? Would the public (including institutional investors) be very keen about utility issues with the holding company act still in the courts?

Issues in the closing days of November totaled $47,089,900, as follows:

New York & Queens Electric Light & Power Company, $25,000,000 first and consolidating mortgage 3½s, due November 1, 1965, sold at 102, to retire the ten-year 6 per cent debentures and indebtedness of affiliates, with about $1,069,465 remaining for additions and betterments to the properties.

Public Service Company of New Hampshire, $10,379,000 of first mortgage 3¾s, series D, due November 1, 1960, at 101¾, to retire the $10,379,000 first and refunding 4½s, due in 1957.

Metropolitan Edison Company, $11,710,900 first mortgage series G 4s, due May 1, 1965, at 102½, to redeem $6,231,400 first and refunding 5s and $5,479,500 first mortgage 5s.

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## Utilities Must Pay Rent for Underground Vaults

New York City will collect approximately $500,000 a year in additional revenues as a result of a recent decision of the Court of Appeals upholding the city's right to exact payment from electric companies for the right to install and maintain underground transformer vaults.

Although the Court of Appeals decision had to do only with the Brooklyn Edison Company, it applies to all electric companies in the city, Assistant Corporation Counsel Joseph L. Weiner stated. Mr. Weiner explained that his estimate on the $500,000 a year added revenue was based on a rental schedule of 25 cents per cubic foot per year for transformer vaults under Manhattan streets and half that rate in the four other boroughs. This schedule, decided upon by the Sinking Fund Commission, must be approved by the Board of Estimate.

Last April the Brooklyn Edison Company sought a writ of mandamus to compel the Department of Water Supply, Gas and Electricity to issue a vault permit after the department had refused to do so. The Appellate Division upheld the writ after a Supreme Court Justice had ruled otherwise. It was the Appellate Division decision which the Court of Appeals reversed.

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## Plan for Reorganizing Middle West Approved

Arbitration, which was requested by the federal District Court, resulted in agreement and court approval last week for reorganization of Middle West Utilities Company, top holding company in the former Insull system, as Middle West Corporation. A high spot in the compromise was granting rights for stockholders to buy new common at $8, $9 and $10 over the next three years. Judge James H. Wilkerson had insisted that equity holders be given a chance to participate in possible future prosperity of the company through some such device.

The secured bank creditors get 1,710,000 of the new common shares, other creditors 1,290,000, the preferred-stock holders 151,928 and the common 158,829.

# Cooke Quits E.H.F.A.; Financing Extended

**Washers, ironers and vacuum cleaners included in appliances to be financed—Dayton utility gets injunction in Miami County row.**

Morris L. Cooke, head of the Rural Electrification Administration and chairman of the executive committee of the World Power Conference, has resigned as chairman of the board of directors of Electric Home and Farm Authority, the government-owned corporation formed to aid in the distribution of electrical equipment.

Lack of sufficient time properly to perform his duties with EHFA is given as the reason for the resignation. Reports that it is due to disagreement over the terms of financing appliances for REA consumers have been denied by both REA and the Reconstruction Finance Corporation, which controls EHFA.

EHFA has recently announced its first contract—Richmond, Ind.—since its expansion to a nation-wide basis, and several more, with both private utilities and municipal power plants, are in process of negotiation. In addition to refrigerators, ranges, water heaters and pumps, the agency is now prepared to finance the purchase of other electrical appliances, including clothes washers, driers and ironers, vacuum cleaners, milk coolers, cream separators and electric motors for household and farm uses. The problem of financing non-repossessable equipment, facilities, notably house wiring and plumbing, is still unsettled, but REA states definitely that some form of governmental aid will be granted to purchasers of this equipment.

Electric Home and Farm Authority has announced that, in order to assist dealers and manufacturers who are now co-operating with the corporation in the territory served by the Georgia Power Company and the Tennessee Electric Power Company, it had approved a selling campaign for the month of December, 1935, under the following terms: Down payment—minimum of 5 per cent or $5, whichever is higher; first installment—due April, 1936 (on the day of the month the electric service bill is due); duration of contract must not exceed the regular term.

The Common Pleas Court, Dayton, Ohio, has granted the Dayton Power & Light Company a temporary injunction restraining Miami County Commissioners from molesting power lines and equipment which the company has erected. The Dayton utility contended the poles were placed in fields along the roadside with the owner's consent. The commissioners asserted the poles were on county land and through County Prosecutor Paul T. Klapp ordered them removed.

# T.V.A. to Invade Kentucky Field

**To make available power to municipalities and other agencies within reasonable transmission distance of T.V.A. dams — Memphis contract signed**

Cheap electricity for Kentucky furnished through development of power and navigation dams by the Tennessee Valley Authority on the Tennessee River is not only probable but is one of the main objectives of the federal government, David E. Lilienthal, T.V.A. director, told an audience in Louisville last week. Describing the program of the T.V.A. to promote the use of water, preservation of land and soil and more widespread use of electricity, Mr. Lilienthal said that the T.V.A. was directed to make the Tennessee River navigable from Knoxville to Paducah, a distance of 648 miles.

The federal government, by selling the power generated at the T.V.A. hydroelectric plants, expects to receive sufficient cash return to make the electricity program self-supporting and in the course of years to repay the investment in the navigation and flood control works, Mr. Lilienthal said.

Mr. Lilienthal also pointed out that private companies operating in the Tennessee Valley area are showing substantial progress as a result of the promotional rate put into effect. He said that the Tennessee Electric Power Company, which operates in the heart of the T.V.A. area, "is having the biggest year of its history." This, he said, is conclusive proof that the T.V.A. program will not destroy the private utilities.

Construction of a dam on the Tennessee River 9 miles downstream from Guntersville, Ala., has been authorized by the authority. The board acted on the recommendation of Carl A. Bock, assistant chief engineer of T.V.A., that this site, known locally as the Cole's Bend Bar site, should be the next to be developed in the authority's river improvement program. The dam will cost $29,000,000. Plans do not include any initial power installation. In the opinion of Arthur E. Morgan, chairman of the board, the Coles Ben Bar project will give the maximum value for navigation, for flood control and future possible power.

Work on the Wheeler Dam of the Tennessee Valley Authority is progressing on schedule, although construction was hampered for a short time by low water that hindered the delivery of concrete materials. The first of 60 radial steel floodgates 40 by 14 ft. is being assembled and installed. Erection of the first 45,000-hp. turbine has started and the contract for an additional similar unit has been awarded to the Baldwin-Southwark Corporation, Philadelphia, Pa., for $315,500. Of the corresponding 36,000-kva. generators, one will be delivered early in 1936 and a contract for the second has been awarded to the General Electric Company for $415,000. All units under order will be delivered in 1936.

The city of Memphis, Tenn., has signed a twenty-year contract with the Tennessee Valley Authority for power from the T.V.A. system. Energy is expected to reach the city within nine or ten months. Contracts with other municipalities forming a loop through western Tennessee are under negotiation.

In carrying out its new employee-relationship policy, T.V.A. is about to put to the test organized labor's ability to cooperate with management in a constructive way. After a year of study and conference T.V.A. has adopted a policy which recognizes the right of collective bargaining and which creates machinery for handling grievances and disputes.

# Japan Pays Tribute to Edison

**Consul-General presents two stone lanterns to inventor's family — Custody of memorial placed with Edison Foundation**

Presentation of a memorial to Thomas Alva Edison from Japan was officially made by Renzo Sawada, Consul-General of Japan to the United States, at a ceremony held Monday afternoon, December 2, at the Edison Library and Laboratory in West Orange, where the famous inventor spent the major part of his life.

The Japanese gift, tendered by the Electrical Association of the Island Empire, was presented to Charles Edison, son of the inventor; A. S. Williams, Jr., and Eugene C. Reed, co-workers at his laboratory, and William S. Barstow, president of the Thomas Alva Edison Foundation. The Japanese memorial is

**Consul-General Renzo Sawada with memorial lanterns presented by Japan**

in the form of two huge stone lanterns, each more than six feet high and weighing more than 4,300 pounds, designed to be placed at the final resting place of Mr. Edison. About 100 persons attended the ceremony. Included among the guests were Owen D. Young, chairman of the board of directors of the General Electric Company and chairman of the national committee of the Thomas Alva Edison Foundation, and Frank A. Wardlaw, secretary of the Edison Pioneers.

Charles Edison introduced the Consul-General, who said in part: "We stand here today in vivid recollection of the immeasurable contributions made by the late Thomas Alva Edison to the comfort, convenience and enjoyment of life. The benefits of his epoch-making inventions are being enjoyed, and will continue to be enjoyed, by man in his daily and hourly life. . . . His contribution is appreciated as deeply in Japan as in this or any other country. The amazing development of the electrical industry in Japan is a silent but eloquent testimony of our appreciation. . . . On behalf of the Electrical Association of Japan, I have the honor to present to the family of Thomas Alva Edison these Japanese stone lanterns. They are exact reproductions of the stone lanterns which are designated as one of our national treasures, handed down from generations back. Modest and unpretentious as they are, they stand as symbols of the eternal light and brilliance that Thomas Alva Edison gave to humanity, and as testimonials of the genuine appreciation of the Japanese people, in whose minds the name of the great American inventor is immortalized. The acceptance of this memorial gift will be highly appreciated by the Electrical Association of Japan."

In accepting the gift for the family, Mrs. Edward E. Hughes, widow of the inventor, said: "It seems fitting that this foundation should be the custodian for the Edison family of this beautiful memorial. I should like William S. Barstow, as president of the foundation, to accept this trust." Mr. Barstow responded: "The Edison Pioneers, the American Institute of Electrical Engineers and the Thomas Alva Edison Foundation appreciate the duty you have assigned to the foundation in delivering into its care for your future direction these emblematic lanterns, to be erected at the final resting place of the greatest single contributor to the progress of the world. Thomas Alva Edison."

## Colonel Knox Assails New Deal Collectivism

Collectivism was charged to the New Deal—traced directly to the doorstep of the White House—by Col. Frank Knox, Chicago publisher and prominent possibility for the Republican presidential nomination, speaking at the annual dinner of the Associated Business Papers, Inc., in New York this week. Colonel Knox deplored what he called the trend toward dictatorship in this country and assailed government "generosity" with the people's money.

The business paper's responsibility correctly to analyze the outlook and, in turn, to present the picture for its own trade was stressed by Willard Chevalier, vice-president of McGraw-Hill Publishing Company, Inc., who explained why the meeting was so concerned with this year's topic, "What Is Ahead?" A. D. Whiteside, head of Dun & Bradstreet, Inc., echoed these opinions and predicted material improvement in building in coming months. Mr. Whiteside asserted the way has been paved for a very substantial future prosperity.

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## Citizens' Committee to Fight New York Power Plant

Eight leading business organizations have begun the active work of organizing a citizens' committee of 500 to oppose Mayor LaGuardia's plan for construction and operation of a municipal "yardstick" power plant in New York City. A sponsoring committee, headed by Louis K. Comstock, president of the Merchants Association of New York, has invited prominent business men and civic figures to participate in the drive against municipal ownership and operation.

The committee of 500, according to the letter of invitation, declared that the organization would be devoted to "opposing the principle of constructing such a plant, of analyzing in detail the facts regarding the proposed plant, acquainting the public with these facts and presenting them in the proper form to the municipal and state governments."

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## New Dealers Assailed at Arkansas Meeting

The federal government in its efforts to extend its power over individuals and corporations, in the name of liberalism, is "perpetrating a fraud upon the people," the Arkansas Utilities Association was told by J. F. Owens, former president of the National Electric Light Association and head of the Oklahoma Gas & Electric Company. Centering his attack on Rexford G. Tugwell and the "brain trusters," Mr. Owens declared: "It is no secret that the present administration holds business in contempt."

The speaker belabored those who seek to change the Constitution, called federal planning "hysterical and stupid experiments," upbraided the agricultural program as resting upon a "basic error" and asserted that "New Deal tinkering" has "destroyed the business man's confidence and initiative to offer employment."

Bernard F. Weadock, vice-president and managing director of the Edison Electric Institute, was among the speakers.

A. G. Whidden of the Arkansas Power & Light Company is the new president, succeeding W. S. Van Sickle of Fort Smith. Other officers are: Paul Clay, Arkansas Natural Gas Company, and James Hill, Arkansas-Missouri Power Company, vice-presidents; R. L. Ritchie, Arkansas Power & Light Company, re-elected secretary and treasurer.

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## Texas Centennial Plans to Turn Night into Day

Dallas intends to be the most brilliantly lighted spot on the continent during the Texas Centennial Exposition next summer, with an electric current consumption close to 20,000,000 kw.-hr. on the grounds. An order has been placed for 200,000 bulbs, ranging from 7 to 10,000 watts, and this will be doubled before the opening, June 6. A battery of 24 searchlights will be the central unit in the $400,000 lighting system.

## COMING MEETINGS

**American Physical Society** — Annual meeting, St. Louis, Mo., December 31-January 2. W. L. Severinghaus, secretary, Columbia University, New York, N. Y.

**American Engineering Council**—Annual meeting, Washington, D. C., January 9-11. Frederick M. Feiker, executive secretary, 744 Jackson Place, Washington, D. C.

**American Institute of Electrical Engineers**—Winter convention, New York, N. Y., January 28-31. H. H. Henline, national secretary. 33 West 39th Street, New York, N. Y.

**Electrochemical Society** — Spring meeting, Cincinnati, Ohio, April 23-25. Colin G. Fink, secretary, Columbia University, New York, N. Y.

## Whitwell and Skinner to Receive McGraw Award

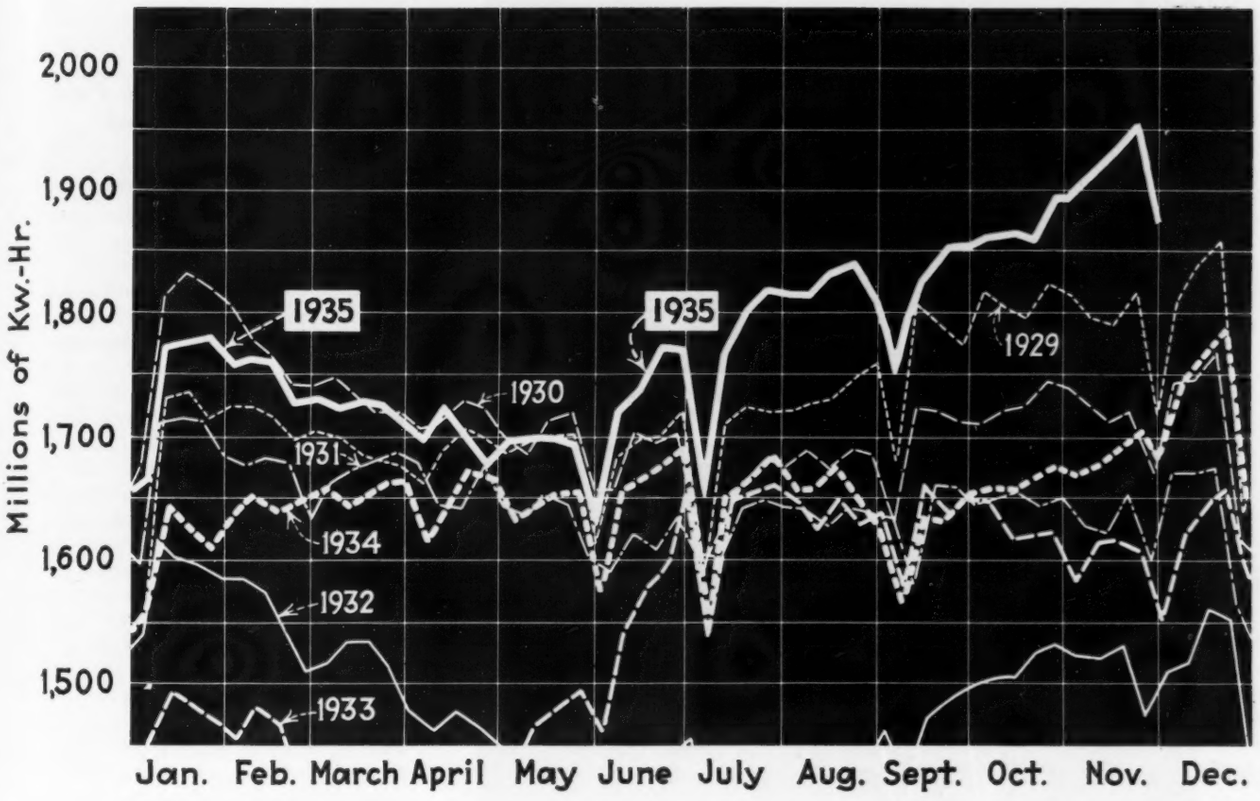
George E. Whitwell

**George E. Whitwell, vice-president of the Philadelphia Electric Company, and Merrill E. Skinner, assistant vice-president of the Niagara Hudson Power Corporation, were announced this week as joint winners of the James H. McGraw award for 1935. The award, conferred for cooperation in any new idea for the advancement of the electrical industry, was voted to Mr. Whitwell for initiating the Better Light-Better Sight activity and to Mr. Skinner as chairman of an operating committee appointed by Mr. Whitwell to carry out details of the movement.**

**Gold medals emblematic of the award will be given to the recipients at a dinner of the Edison Electric Institute and the Illuminating Engineering Society to be held at the Biltmore, New York, on December 10. The award was established eleven years ago by James H. McGraw, chairman of the board of the McGraw-Hill Publishing Company, Inc.**

Merrill E. Skinner

# Output Rises 9 per Cent Above 1929




Again establishing a new record, the output of central stations for the week ended November 23 rose to 1,953,119,000 kw.-hr., according to the Edison Electric Institute. This was 14.5 per cent more than in the like week of last year, 7.2 per cent above the corresponding week of 1929, and about 5 per cent above the December peak of that year.

The following week brought the usual dip due to Thanksgiving, to 1,876,684,000 kw.-hr., but this recession was smaller than in 1929 and brought up the increase over that year to 9.2 per cent. As is evident from the chart, the current year's operations have been steadily drawing away from the 1929 figures since the beginning of October, when the excess was only 2.4 per cent. Present indications point to a peak, within the next few weeks, in excess of 2,000,000,000 kw.-hr. and close to 10 per cent above any previous week's output in the history of the industry. In the Central industrial region the output during the past month has averaged 20 per cent greater than in 1934 and in the Mountain states 18 per cent greater.

**Weekly Output, Millions of Kw.-Hr.**

| 1935 | | 1934 | | 1933 | |
|---|---|---|---|---|---|
| Nov. 30 | 1,877 | Dec. 1 | 1,684 | Dec. 2 | 1,554 |
| Nov. 23 | 1,953 | Nov. 24 | 1,705 | Nov. 25 | 1,608 |
| Nov. 16 | 1,939 | Nov. 17 | 1,691 | Nov. 18 | 1,617 |
| Nov. 9 | 1,914 | Nov. 10 | 1,676 | Nov. 11 | 1,617 |
| Nov. 2 | 1,897 | Nov. 3 | 1,669 | Nov. 4 | 1,583 |
| Oct. 26 | 1,896 | Oct. 27 | 1,677 | Oct. 28 | 1,622 |

**Per Cent Change from Previous Year**

| Region | Week ended Nov. 30 | Nov. 23 | Nov. 16 |
|---|---|---|---|
| New England | +11.5 | +14.3 | +16.7 |
| Middle Atlantic | + 9.6 | +11.5 | +10.8 |
| Central Industrial | +18.6 | +20.1 | +21.4 |
| West Central | + 9.2 | +13.6 | +17.4 |
| Southern States | +12.2 | +12.3 | +10.7 |
| Rocky Mountain | +17.1 | +19.9 | +17.9 |
| Pacific Coast | +12.8 | +13.2 | +12.8 |
| United States | +11.5 | +14.5 | +14.6 |

## Output Passes All Records

More energy was generated in public utility plants during October than in any other month, in any year. The total, as announced by the U. S. Geological Survey, was 8,833,071,000 kw.-hr. The previous largest monthly production was 8,708,623,000 kw.-hr. in October, 1929. These figures are not to be confused with those for central stations alone, since the Geological Survey includes, in its survey, electric railway plants, public works plants and others contributing to the public supply, nor does the preceding statement regarding the largest *monthly* total conflict with the figures of the Edison Electric Institute which show that the largest *weekly* total in 1929 was generated in a December week.

The average daily production in October, 284,938,000 kw.-hr., surpassed that of September by 4.1 per cent whereas the normal change from September to October is an increase of 2.7 per cent, and it exceeded that of October, 1934, by 13 per cent. For the fourth consecutive month the gain over last year was 10 per cent or larger. Water power contributed 32 per cent of the total, against 39 per cent in August and 37 per cent in September.

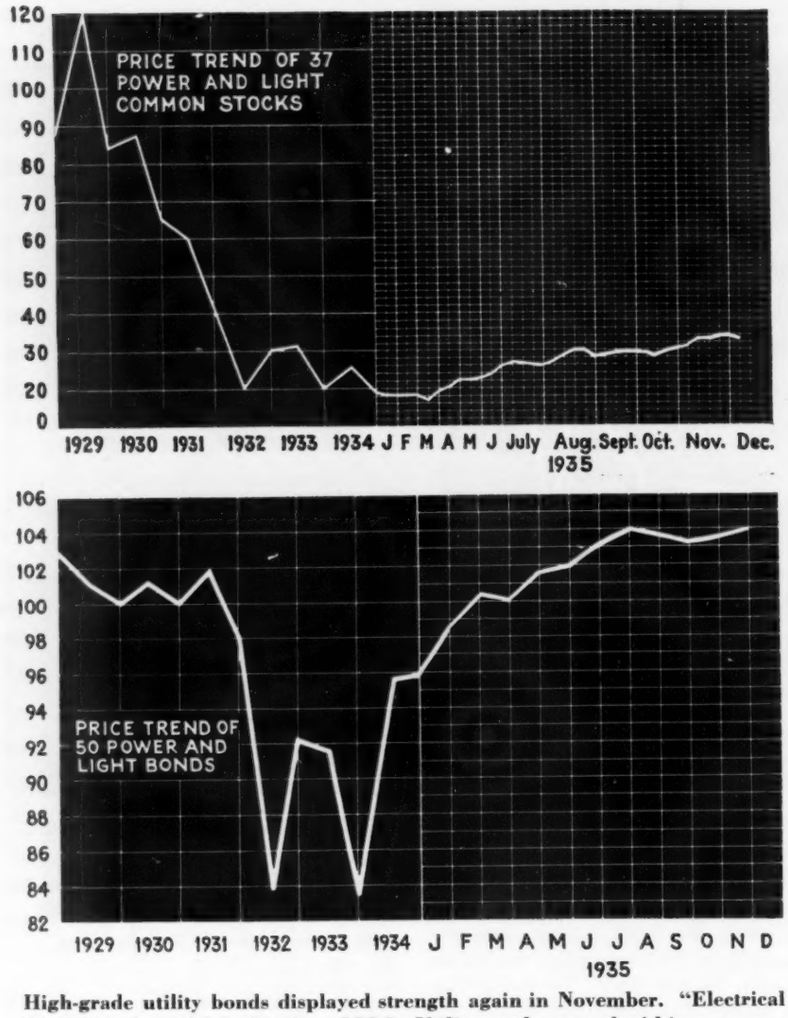
**Regional Gains Over 1934, per Cent**

| | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|
| United States | + 5 | +10 | +11 | +14 | +13 |
| New England | + 8 | +10 | + 7 | +16 | +14 |
| Middle Atlantic | + 4 | +10 | + 8 | + 9 | + 8 |
| E. No. Central | — 3 | + 7 | +12 | +14 | +17 |
| W. No. Central | +18 | +15 | +11 | +16 | +12 |
| South Atlantic | 0 | + 8 | +18 | +25 | +19 |
| E. So. Central | +28 | +21 | + 3 | +13 | 0 |
| W. So. Central | 0 | + 6 | + 6 | + 8 | +10 |
| Mountain | +35 | +36 | +41 | +40 | +22 |
| Pacific | + 7 | + 6 | + 9 | +11 | +12 |

## Courts' Injunction Powers Limited by New Ruling

Federal courts granting or refusing temporary injunctions in equity suits must, in future, make specific findings stating the facts and legal considerations impelling their action, according to an order issued November 25 by the U. S. Supreme Court. Included in the type of actions affected are suits involving rates and the testing of federal and state laws, notably PWA loans to municipalities for power plant construction.

# Utility Bonds Advance; Stocks Lower




**High-grade utility bonds displayed strength again in November. "Electrical World" index, 104.4; October, 103.8. Utility stocks moved within a narrow range this week. "Electrical World" index, 33.1; last week, 33.6**

## R.F.C. Sells Holdings in Utilities Power & Light

By selling a $2,288,000 block of debentures of the Utilities Power & Light Corporation to the Manufacturers Trust Company of New York for $1,844,104.72 the Reconstruction Finance Corporation took itself out of the public utility business last week. The sale, announced by Jesse H. Jones, chairman of the R.F.C., brought to a close the episode in which the R.F.C., as a result of its loan to the old Central Republic Trust Company, or Dawes bank, in Chicago, found itself in virtual control of a utility system (ELECTRICAL WORLD, March 30, page 125). Collateral pledged for the Dawes loan, on which the R.F.C. foreclosed, controlled the voting stock of the Public Utilities Securities Corporation, top holding company in the Harley L. Clarke utility system.

The stock was controlled by two notes of the Webster Corporation, financing affiliate for the Clarke system, which the Dawes bank pledged with the R.F.C. and which the R.F.C. eventually took over. The R.F.C. later traded these notes to the Atlas Corporation for the debentures of the Utilities Power & Light Corporation. By selling these debentures to the Manufacturers Trust for about 60 per cent more than their current market value the R.F.C. has now disposed of its direct utility holdings.

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## Standard Gas Ready to Pay October Interest on Notes

Announcement was made this week by John J. O'Brien, president, that the October 1 interest on the twenty-year 6 per cent gold notes and 6 per cent convertible gold notes of Standard Gas & Electric Company, which matured October 1, is available for payment. The payment of this interest follows the recent action of the Circuit Court of Appeals of the United States for the third circuit in dismissing the appeal from the decision of the United States District Court of Delaware denying a petition for an injunction restraining the payment of the interest. Resumption of interest on series B debentures was also authorized.

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## Penn Southern Notes Paid; Voting Trust Dissolved

The voting trust in which all capital shares of Penn Southern Power Company were held has been dissolved and all the directors and officers have resigned, as the result of payment in full of $2,900,000 due on that utility's notes held by the New York Trust Company. The Associated Utilities Corporation, a subsidiary of the Associated Gas & Electric Company, cleaned up the debt. It also arranged for a new note with the Chemical Bank & Trust Company to cover $450,000 due to that bank from Penn Southern Power. Termination of the voting trust was contingent upon redemption of the notes. Previously the Associated system had acquired all the stock of Penn Southern Power Company for approximately $1,150,000, including release of certain claims affecting Penn Southern's subsidiaries (ELECTRICAL WORLD, October 12, page 44).

Penn Southern Power was formed in 1933 by order of Irwin Kurtz, referee in bankruptcy, to acquire stocks of five operating companies of the National Electric Power Company, a unit in the Insull system.

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## Bay State Raises Price as Utility Offers Stock

For the first time since 1927 the Massachusetts Department of Public Utilities has insisted on a higher-than-proposed price on stock which Edison Electric Illuminating Company of Boston offered to stockholders. The suggested price was raised from $140 to $150 a share and the amount to be sold reduced from 89,146 to 82,289 shares. The commission contended the $8 dividend rate justified the higher price in the present cheap money market.

The company proposed to raise $12,500,000 from this financing, which, with cash on hand, would be applied to redemption of $16,000,000 of notes due April 15.

## New York Metal Prices

| | Nov. 20, 1935 Cents per Pound | Dec. 4, 1935 Cents per Pound |
|---|---|---|
| Copper electrolytic | 9.25* | 9.25* |
| Lead, Am. S. & R. price | 4.50 | 4.50 |
| Antimony | 14.00 | 14.375 |
| Nickel ingot | 35.00 | 35.00 |
| Zinc spot | 5.775 | 5.225 |
| Tin Straits | 51.50 | 51.75 |
| Aluminum, 99 per cent | 19—21 | 19—21 |

*Delivered Connecticut Valley.

# MANUFACTURING AND MARKETS

## Business Trend Supports Optimism

**Favorable**

Power output 9 per cent above 1929.
Holiday trade outlook bright.
Industrial operations continue brisk.
Building upturn widely predicted.

**Unfavorable**

Utility suits retard expansion plans.
Dec. 1 deadline stops new bond issues.
Steel price rise fails, orders lag.
Opening of Congress nears.

## Bureau to Sponsor Electrical Kitchens

Formation of the electric kitchen bureau under the chairmanship of George E. Whitwell, vice-president of Philadelphia Electric Company, and sponsored jointly by the Edison Electric Institute and the National Electrical Manufacturers Association, was announced recently. The organization plans at least three years' effort in fostering and coordinating all national activities in the all-electric kitchen field as well as in promoting local interest. NEMA's O. C. Small will serve as secretary.

Zoning of the entire country and appointment of regional directors is contemplated, while the bureau plans to maintain a staff of traveling representatives.

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## Electrical Manufacturers Declare Extra Dividends

Directors of Kelvinator Corporation have declared an extra dividend of 20 cents a share in addition to the regular quarterly dividend of 12½ cents. Both dividends are payable January 2 to stock of record December 5.

The Electric Storage Battery Company has declared a special dividend of $1 and a final dividend for 1935 of $1 on both the common and cumulative participating preferred stocks, bringing total disbursement for the year to $3.50, including the special dividend. A year ago the company declared a final dividend of 75 cents for 1934, making total payments in that year of $2.25.

A special dividend of 50 cents has also been declared on the common stock of the Wagner Electric Corporation.

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## Ask Better Equipment

That a need exists for improvement in certain classes of electrical equipment for commercial cooking establishments and cheaper wiring for this equipment were two of the principal conclusions reached at the conference of commercial cooking representatives of member companies of the Northwest Electric Light and Power Association, Seattle. Another proposal was that field men be supplied with more promotion material. The meeting was held under the auspices of the Commercial and Industrial Sales Bureau.

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## General Electric Drops Its Unemployment Fund

With the advent of federally administered "social security" January 1, General Electric will terminate its unemployment compensation plan, according to Gerard Swope, president of the company. Since the fund's inception in 1930, employees and the company have paid in more than $7,000,000 to care for workers.

About $3,000,000 of the fund remains, while loans totaling approximately $800,000 have been made and $500,000 repaid, indicating unemployment benefits of $3,700,000. Of the balance on hand, $1,750,000 is in the local works fund, with three plans offered for its disposition; namely, distribution of about $20 each to 45,000 employees; end payments December 31, but continue benefits as long as the money lasts, or end payments but allow the fund to be used as part of the proposed relief and loan plan.

The other $1,250,000, in the general fund, cannot be returned, but will be applied to "purposes beneficial to the employees," perhaps divided among the various groups proportionately for the new relief and loan plan. The company also is restoring vacations with pay for hourly workers next year. The Lynn, Mass., plant has increased working hours to 40 from 36 hours a week.

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## Potters' Strike Closes Ohio Insulator Works

Ohio's two-month old pottery strike has again closed the Ohio Insulator Company at Barberton, after it had been reopened to allow any former employees to return who cared to do so. Operations were halted, with about 50 workers on the job under the protection of a like number of guards, when Sheriff James T. Flower announced the danger of a riotous outbreak was too real. The company contends it paid its employees higher wages than were general in the field.

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## Lamp Sales Increase

The five-county fall lamp campaign, sponsored by the Electrical Association of Philadelphia with the co-operation of General Electric Lamp Company, Hygrade Sylvania Corporation and Westinghouse Lamp Company, resulted in the sale of 1,410,848 lamps with a retail value of $210,000 in the 31 days. Unit volume gained 16 per cent over last year's drive.

## To Correct Any Misconception

In reading your article on page 49 of the November 23, 1935, issue of the ELECTRICAL WORLD, under the caption "NEMA's 1936 Program Widens Scope of Service," I note you start this article as follows: "Dropping all activities which might be construed as influencing price competition, in deference to a Federal Trade Commission complaint, . . . . " etc.

The National Electrical Manufacturers Association has never done nor attempted to do anything in connection with the prices which its members receive for their products. It and its predecessors have been operating as a trade association since 1908 and have carefully avoided any activities which might be held to be contrary to the anti-trust laws.

The beginning of the above-mentioned article conveys the opinion that NEMA did have, at one time, activities which influenced price competition, and is dropping these on account of the Federal Trade Commission complaint. As I have pointed out, activities in connection with prices have never been part of the activities of the association, either primary or secondary, and its plans, policies and activities have been in no wise changed by the proceeding recently started by the Federal Trade Commission.

F. C. JONES,
President, NEMA.

## Electric Industry Takes Part in Great Lakes Exposition

Present plans for the Great Lakes Exposition to be held in Cleveland next year during the months of July, August and September indicate that a major portion of the exhibition space will be devoted to the electrical industry. Men prominent in the electrical industry who are members of the exposition organization committee include E. G. Crawford, Cleveland Electric Illuminating Company, and J. F. Lincoln, Lincoln Electric Company.

The exposition, the largest civic event in the history of Cleveland, will be staged on 80 acres of downtown Cleveland lakefront. The purpose of the exposition is to present a cross-section of the industrial, commercial, cultural, educational and social life and progress of the Great Lakes area. The exposition is organized on a non-profit basis.

•

## Traveling Sales Meeting Pushes G.E. Apparatus

General Electric's Camp Circuit, or traveling sales convention, will wind up its tour of the five district territories in the next ten days after meetings for apparatus salesmen in New York, Philadelphia, Boston, Cleveland and Chicago. The Camp Circuit replaces the single meeting previously held in Schenectady, striking the optimistic note that there has been no depression in creative thinking or inventive genius. It has stressed the possibilities for industrial modernization opened by the upward business trend.

The eight-week fall drive of the General Electric specialty appliance sales division ended with 125 per cent of the quota, $1,261,000 over last year's campaign, the company announces. Salesmen will divide cash prizes of nearly $200,000.

•

## Report on Sight Saving

Accomplishments of the sight savers and plans for the future are outlined in the annual report of the Sight Saving Council of Cleveland, first organization of its kind in this country. In its first year the group arranged 517 addresses to 139,498 persons; distributed 298,283 copies of its three booklets, and presented fourteen weekly broadcasts over WGAR, in addition to a long list of more specialized activities.

•

## Carbondale Names Officers

Carbondale Machine Corporation, Harrison, N. J., recently reorganized as a subsidiary of Worthington Pump & Machinery Corporation, to cover the manufacture and sale of all classes of refrigeration, ice manufacture and air-conditioning equipment, has announced officers as follows: H. C. Ramsey, president; H. A. Feldbush, vice-president; A. H. Baer, vice-president in charge of sales; A. L. Prentice, secretary and treasurer; W. Lehman and F. D. Talmage, assistant secretary and assistant treasurer, and C. A. Packard, comptroller.

•

## Firm Changes Name

Thwing Instrument Company of Philadelphia announces a change in its name to the Thwing-Albert Instrument Company, but states no alteration in ownership, management or policy is implied. The change honors E. J. Albert, associated in the business for seventeen years.

•

## Electric Works Sold

Purchase of the American Electrical Works of Phillipsdale, R. I., by Kennecott Copper Corporation was announced recently. While several Kennecott officials joined the executive personnel, it was stated that no changes would be made in operating or sales officers.

# Field Reports on Business

General optimism on business continues, with the approaching Congress session among the few clouds, special reports to ELECTRICAL WORLD indicate.

### NEW ENGLAND

Electrical men report general improvement in business in nearly all important fields. Increasing interest is being shown in projects for enlarging power plant capacity to meet expected future peaks in production. Preliminary figures are already being sought on the cost and in some cases bids may be in order soon. Outstanding among the undertakings which spell sales to electrical manufacturers are the government's plans for early expansion of its sea power. The Bath Iron Works is to build three 1,850-ton destroyer leaders; three submarines are to be constructed at the Electric Boat Company's plant in New London and two at the Portsmouth navy yard. The Boston navy yard will build three 1,500-ton destroyers and the Bethlehem yard at Quincy is to build an airplane carrier.

New housing developments are stimulating sales of metering equipment, but interior wiring sales are somewhat inactive and prices rather demoralized. Electrical merchandise is beginning to move in the holiday trade and deliveries have been greatly improved as the result of concentrated manufacturing efforts. Some distributors, in fact, report that the shortage recently prevailing in socket devices and especially in hollow ware has been fully overcome. Off-season sales of refrigerators are encouraging and electric range sales have shown considerable life on the Boston and Brockton Edison systems. Air-conditioning business in New England is 30 per cent ahead of last year. In the industrial field motor sales are sporadic, although running into fair volume. Sales of electric welding equipment have been excellent. Collections are very satisfactory, according to leading wholesalers.

### CHICAGO

The Middle West shows strong symptoms of becoming turbine conscious. Utility and industrial executives apparently are beginning to feel that recognition of new capacity requirements cannot be put off much longer for inquiries are starting now to change almost overnight into orders. The largest order concerning which current rumors float is for a 60,000-kw. unit and it is becoming almost a commonplace to hear of sales of smaller units. One manufacturer's representative said he was at the moment working on seven different turbine proposals. It is quite plain that utility engineers are thinking less about line ties to bolster up system capacity and more about actual generation.

Buying by utilities and industrials continues to consist pretty much of materials and equipment required for maintenance and for necessary rehabilitation, but only for such capital expansions as are literally forced. Buying is still very much under wraps and probably it will not really start to go places for a while. Yet bread-and-butter purchasing rolls up to comfortable volumes. According to Chicago Electrical Association statistics for October, 68 per cent of the manufacturers in this area reported business higher than in September.

### NEW YORK

So convincing has been the current upswing in business that optimism at present is scarcely tempered even by warnings over the approaching session of Congress and the fact that 1936 will be a presidential election year. Holiday trade, favored by a stock market which at least refuses to recede much from the recent tops, continues the brightest spot in the picture and all the other business barometers continue to tell the same favorable story.

Nevertheless, the fight over the utility law promises to be a long one and there is reason to doubt that the industry will be as big a spender over the next few months as would otherwise be the case. That $3,000,000,000 expansion budget, so much discussed, may trickle out, but it won't gush. Miscellaneous electrical equipment continues to move, however. The copper market has had several exceptionally active days recently, but spot prices remain unchanged.

### PACIFIC COAST

Pacific Coast retailers are preparing for the best holiday trade in years as all indices continue to rise. The rising volume of power production, car loadings, automobile sales and wholesale commitments, particularly in electrical appliance lines, presages a brisk close for the year's business.

From the standpoint of the electrical industry the record production of many Western systems inspires optimism. Domestic load building plus a revival of the industrial load have resulted in increased appliance sales and for a steady if not spectacular volume of industrial business. Construction, particularly in the heavier classifications, continues slow. Model all-electric homes have attracted much attention and residence building on speculation by the larger contractors also has increased.

New business of the immediate future includes the pumping plants for the Metropolitan Water District Aqueduct, the power transmission system on the San Francisco-Oakland Bay bridge, which calls for both 600- and 1,200-volt railway power, and the equipment for the 150-mile transmission line from Boulder Dam to Pinoche, Nev.

# 1936 MODELS OF I-20 METERING

## All have the same element, the well-known Type I-20 —and differ only in the method of mounting

THE standardization program on meter mountings moves a long step toward completion by developments made during 1935. General Electric now offers:

The **ALL-SERVICE** mounting—a new connection box with complete test and disconnection facilities for use with the standard G-E Type I-20-A bottom-connected meter.

The **ENCLOSED** mounting—a new protector case with complete test and disconnection facilities for use with the standard G-E Type I-20-A bottom-connected meter.

The **SOCKET** mounting—a receptacle for the standard I-20-S G-E socket-type meter.

Electric-service companies now have a choice of these three mountings for the G-E Type I-20 watthour meter, which meet every installation requirement. They are all carefully designed for convenience, safety, long life, and protection; they should result in reduced inventory expense and lower-cost installation, inspection, and disconnection.

### ALL-SERVICE Mounting

This mounting makes it possible to use one standard meter on any installation, outdoors or indoors. Hence meter stocks can be reduced.

It simplifies meter mounting and wiring. The connection box has outlets at the sides, bottom, and back. This permits a choice of position for service and house wiring.

It makes a completely metal-clad installation, with provision for modern sealing methods. Access to the meter by drilling is extremely difficult; shunting of terminals is impossible.

There are other advantages, such as economical service disconnection, safe and quick testing, neat appearance, good electrical connections, and long life.

### ENCLOSED Mounting

This mounting has the same installation advantages as the ALL-SERVICE mounting and provides additional protection to the meter itself.

Easily removable breakouts in the top, bottom, sides, and back, assure convenient connections. Attachable nipples for standard conduit sizes permit stock reductions. Accessories provide for unit installation of several protector cases, ganged either horizontally or vertically.

### SOCKET Mounting

Recent improvements in the G-E Type I-20-S meter for use with SOCKET mountings are:

A new base-plate assembly increases the over-all dielectric and mechanical strength. It consists of a Textolite terminal plate riveted to a skeleton metal base plate with a cork gasket between them. Sturdy guards for the meter-terminal blades are an integral part of the Textolite block.

A hanger at the top of the base-plate assembly, which can be used to store meters on test-department racks, and can be swung down into a recess in the base when the meter is to be placed in service.

These new features provide greater convenience and a socket-meter unit that is fully insulated.

### COMPLETE G-E INSTALLATION

In addition to watthour meters and accessories, General Electric is now in a position to furnish tamperproof service cable, in three new designs, and such fittings as straps, supports, and hooks.

For complete information, including new detailed installation drawings, address the nearest G-E sales office or General Electric, Dept. 6C-201, Schenectady, N. Y.

400-14

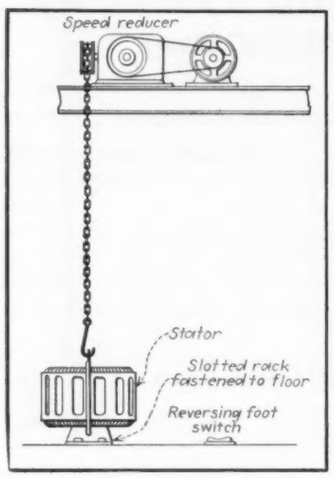
GENERAL ELECTRIC

# OPERATING PRACTICES

ENGINEERING • CONSTRUCTION • OPERATION • MAINTENANCE

## Power Puller for Removing Motor Coils

In a motor rewinding shop one of the meanest jobs is pulling coils out of a stator. After the end turns are cut on one side a crowbar and copious profanity are usually employed to worry the coils out from the other. But for a couple of years now no armature winder has sworn at a reluctant stator coil in the motor shop of Chevrolet plant No. 7 at Flint, Mich. The reason is that getting out stator coils is no longer an affair of main strength and awkwardness in this shop. The job is done by "sicking" one motor on to another. The sketch above shows how.




**One motor pulls stator coils of another**

The chain and chain wheel were salvaged from an old hand hoist and the wheel was keyed on the slow shaft of a discarded speed reducer driven by V-belt from a small motor. The whole assembly was mounted overhead on a pair of I beams. Immediately below, a straight slotted rack was fastened to the floor so that any ordinary size motor stator can be set on it and clamped down. Hung on the chain is a sharp pointed hook, specially forged to catch the stator coil loops. Movable on the floor and connected to the motor overhead is a foot-operated reversing switch so the hook can be lowered to take hold of another coil after yanking the previous one out.

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## Locating Faults on Buried Cable

By C. L. ABBOTT
Underground Department
Nebraska Power Company, Omaha

To save time in selecting the place to dig to uncover a ground fault on buried cable quick location of the trouble is essential. It has been necessary to use the method described here only once, but the old Wheatstone bridge is a pretty consistent performer and probably the record will continue good.

The ground fault, say, is on a parkway street lighting cable. A storage battery is connected with husky conductors to separated points on the cable between which the fault lies. An auxiliary wire is connected to these same points. Then, starting at any point along the auxiliary wire, a contact is made through the insulation with one lead of a millivolt meter. The other lead is attached to a grounding rod. The grounding rod can be made in the form of a cane to aid in pressing it into the earth. A reading is taken; if the reading is negative, reverse the meter leads at the meter.

As the fault location is approached the lower becomes the meter readings, and when the contact point is directly over the fault the meter reads zero. The closer the auxiliary wire approximates the faulty cable in length and position the nearer the fault location is established. The larger the battery lead the greater becomes the available test voltage. The auxiliary wire can be small and its insulation should be such as to be easily punctured for contact points.

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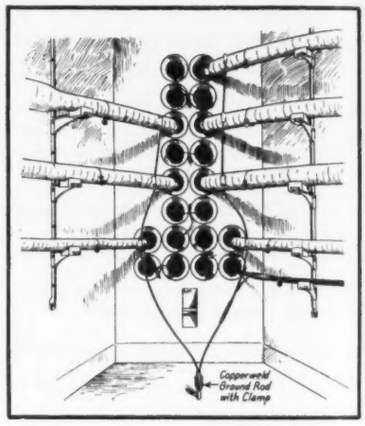
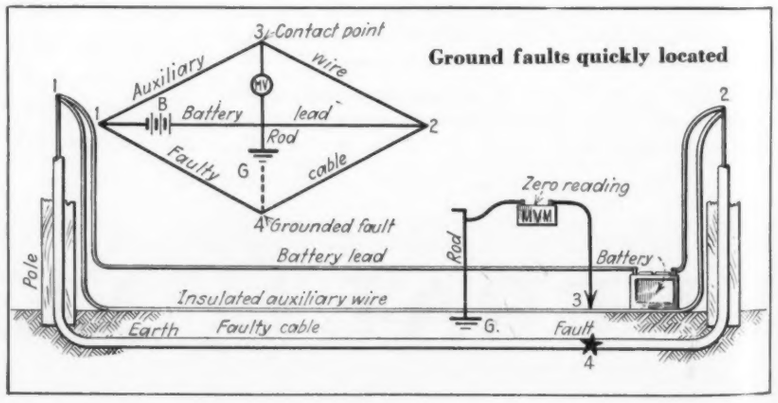
## Grounding Sheaths in 13-Kv. Manhole

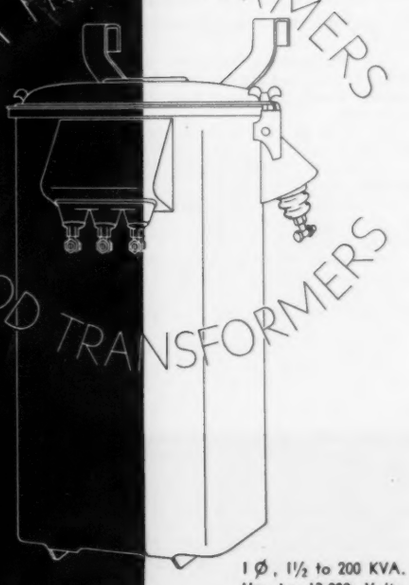



This manhole forms the distributing point at a power plant where the underground cables lead out to various sections of the city. Cable ducts leave the manhole in four directions. At each position the sheaths of all the cables are bonded together and connected to "Copperweld" ground rods. These four rods are joined by a copper bus which encircles the vault in the earth under the concrete floor.




**Ground faults quickly located**

LOWERING L-M TRANSFORMER COILS INTO TREATING TANK




1 Ø, 1½ to 200 KVA.
Up to 13,800 Volts.

# L-M TRANSFORMER COILS ARE CAREFULLY DRIED and IMPREGNATED!

All L-M Transformer coils are dried in heating tanks at atmospheric pressure for a definite time. They are then subjected to a 28-inch vacuum for a certain number of hours. This treatment removes all moisture from the cotton and paper insulation in the coils.

The coils are then impregnated with an oil-proof compound under pressure which improves the dielectric strength and prevents entrance of moisture, transformers' greatest enemy.

Temperatures and pressures throughout the process are controlled by latest type automatic recording and regulating instruments and equipment.

*One reason why "L-M TRANSFORMERS ARE BETTER TRANSFORMERS."*

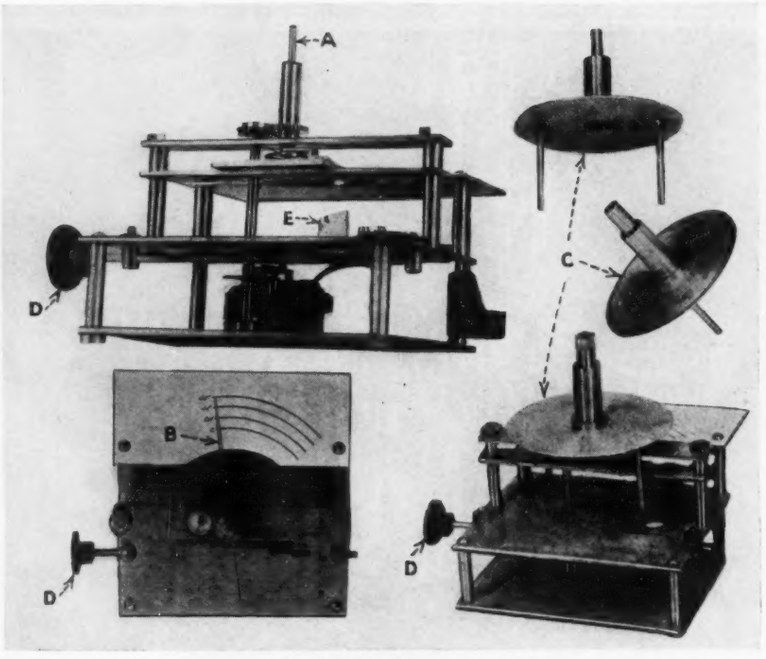
## LINE MATERIAL Co

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

# Making Up Outdoor Wall Boxes

**The making up of outdoor boxes should not be left to the chance ideas of an electrician or to hit-or-miss methods. Such procedure results not only in waste but in unsightliness. Details mark the difference between a good and a poor distribution system. The accompanying instructions from the Detroit Edison Company show how carefully such details are treated by experienced engineers.**

(a) Determine position for wall box. Measure approximate length of cables required from junction box in manhole to wall box.
(b) Pull in cables from manhole to wall box position.
(c) Screw "straightaway fitting" on to conduit and reducer.
(d) Slide conduit over cables and raise to position against wall. Set box temporarily on top of fitting.
(e) Mark cable sheaths at a point even with the bottom of bowls of lugs.
(f) Take box down, lower conduit away from wall and pull off of cables.
(g) Cut cables at marks.
(h) Measure 6 in. from end of cables. Crease sheaths.
(i) Remove sheaths back to crease. Do not bell sheaths.
(j) Remove conductor insulation for 2 in. from end. Cut end of insulation square.
(k) Clean ends of conductors and sweat lugs in place.
(l) Apply two layers of ½-in. paragon tape, half-lapped, from end of sheath to lug.
(m) Apply one layer of ½-in. paragon tape, half-lapped, over body of lug and tape already applied and extending 1-in. over lead sheath.
(n) Paint tape with asphaltum paint.
(o) Slide conduit over cables and raise to position against wall. Strap conduit in place.
(p) Place box over cable ends and bolt firmly in position.
(q) Bolt lugs to terminals in box.
(r) Ring out cable connected to neutral (center) bar in box and connect to neutral in manhole.
(s) Connect one of remaining cables to positive in junction box in manhole. Connect other cable to negative in junction box.
(t) Install fuses as ordered by foreman.




**For checking jewels quickly**

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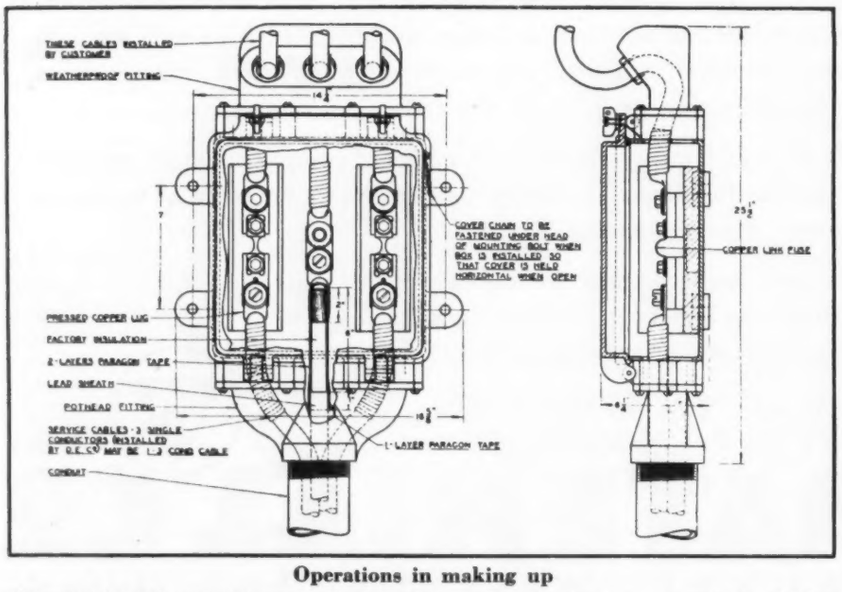
# Friction Check for Meter Jewels

By JOSEPH LANG
Meter Department, Public Service Company of Colorado, Denver

Jewels that might be passed as O.K. by microscopic examination are frequently rejected by a friction device for testing meter jewels which was developed and is used in the meter department of the Public Service Company of Colorado. The device consists of a revolving vertical shaft which is driven at 25 r.p.m. by a small synchronous motor. On top of the shaft "A" can be mounted either a ball bearing or a pivot corresponding to the type used with the jewel being tested. The indicator hand "B" is pivoted directly under the shaft and is maintained at zero position by a hairspring.

The cleaned jewel is held firmly in a slotted jacket in the center of a meter disk "C," from the opposite edges of which two rods are rigidly suspended. Different types and weights of disks are used for different jewels. As the disk is placed over the shaft, contacting the jewel revolving pivot or ball bearing, it is restrained from turning by a latch "E," which blocks one of the suspended rods so as to insure the same starting position for each test. When the latch is released by pressing button "D" the disk starts to turn and gains momentum at a rate proportional to the friction between the jewel and pivot. After it has started to revolve the two rods on the bottom of the disk engage with the indicator hand and carry it over the scale to a point where the hairspring tension overcomes the motion of the disk. If this deflection does not exceed the amount predetermined by testing new jewels, then jewel is kept. Otherwise the jewel is recleaned and tested again. If it does not pass this second test it is discarded.


THESE CABLES INSTALLED BY CUSTOMER
WEATHERPROOF FITTING
COVER CHAIN TO BE FASTENED UNDER HEAD OF MOUNTING BOLT WHEN BOX IS INSTALLED SO THAT COVER IS HELD HORIZONTAL WHEN OPEN
COPPER LINK FUSE
PRESSED COPPER LUG
FACTORY INSULATION
2-LAYERS PARAGON TAPE
LEAD SHEATH
POTHEAD FITTING
SERVICE CABLES-3 SINGLE CONDUCTORS INSTALLED BY D.E.CO MAY BE 3 COND CABLE
1-LAYER PARAGON TAPE
CONDUIT

**Operations in making up**

**600-volt, 100, 200 and 400-amp. outdoor wall box (Noark) for No. 4 A.W.G. to 500,000-circ.mil, three-conductor or three one-conductor rubber and lead cables**

DILECTO
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VULCOID
A THERMO-PLASTIC
NON-HYGROSCOPIC
INSULATING MATERIAL

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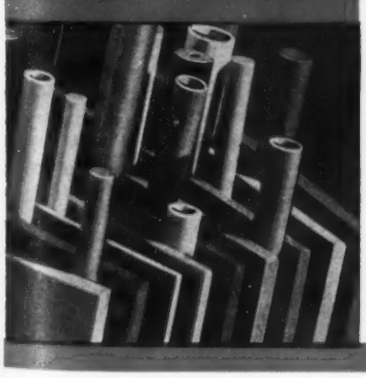
BONDED MICA

# *Insulating Materials*



Because we manufacture all these insulating materials —have modern and complete facilities for fabricating them at two conveniently located plants; Newark, Delaware, and Valparaiso, Indiana—and have made thousands of varied applications of them throughout all industry—we can offer you an unbiased recommendation as to the appropriate one for you to use.

Catalogs have been prepared—and are immediately available—containing engineering date of value to every production, design and purchasing executive. Please write us if you would like copies of these catalogs.

## CONTINENTAL-DIAMOND FIBRE COMPANY

**NEWARK, DELAWARE**

*District Sales Offices:*

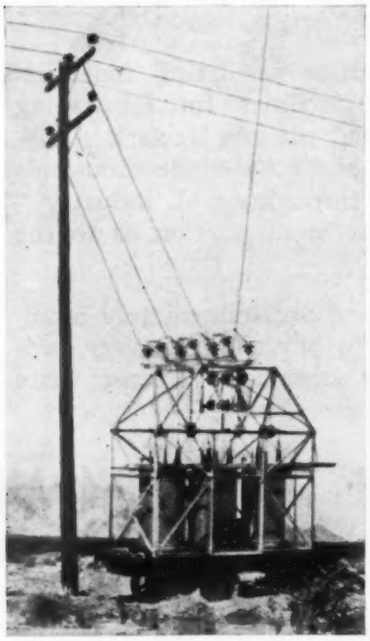
Chicago, Cleveland, New York, Los Angeles, San Francisco, Spartanburg, S. C., Bridgeport, Pa. In Canada, Diamond State Fibre Company of Canada, Ltd., 356 Eastern Avenue, Toronto, Canada.

## Portable Substation Aids Construction

The multiplicity of construction activities along the 300-odd mile route of the Metropolitan Water District's aqueduct from the Colorado River to Los Angeles requires electrical power to be available at numerous points. While the 33-kv. transmission line parallels the route, power at utilization voltages has to be made available at such places, even though requirements for energy are temporary. To facilitate distribution problems a portable substation was designed and has proved both satisfactory and economical.

Using a 5-ton truck trailer as a chassis, the substation was constructed of three transformers inclosed in a compact steel rack and surmounted by a typical three-pole air-break switch. The substation is placed along the transmission line and the primary connected with hot-line connectors by the patrol crews. The secondary terminates in a cable junction box and is interlocked with the handle on the air-break switch. Where the substation serves an electric dragline or shovel it is the practice to string out 1,000 ft. of three-conductor cable to minimize the number of substation moves per mile.

As the cost of the portable substation is about the same as one on the ground, the economy of the arrangement comes in substituting the time necessary to move and connect the substation for the extra miles of 2.3-kv. distribution circuits that would have to be built were not the portable type employed for the service. Seven of the units are now in service.



**Portable 33-kv/2.3-kv. substation saves construction of many miles of secondary circuits**

Patrol crews "install" a substation in the time it takes to make hot line taps for the primary circuits of the portable substation.

•

## Arc Welding Cuts Fabrication Costs

Electric arc welding as a substitute for casting in the fabrication of machinery is becoming increasingly popular in this country. Reduction in weight, saving in material, greater strength and quicker delivery are among the advantages claimed for this fabrication process by W. N. Norberg, Westinghouse Electric & Manufacturing Company.

The following analysis of welding and casting costs for an actual case will illustrate the advantages claimed:

| Welded Steel Construction | | Cast Construction | | Difference | |
|---|---|---|---|---|---|
| Weight | Cost | Weight | Cost | Weight | Cost |
| 3,465 | $125 | 5,000 | $187 | 1,535 | $62 |

Cast delivery six weeks. Welded delivery, three weeks.

In this case the saving of weight of 1,535 lb. is about equal to the saving in cost if we assume a cost of $0.04 per pound for cast iron. At times the saving in weight is important in large machines. Large welded machines can frequently be shipped in one piece, whereas similar machines of cast construction would have to be dismantled for shipment.

Welding is not confined to large work exclusively. Small parts of unusually intricate design which are difficult to cast are welded, even though production is in large numbers.

Whether to use welding or casting is a question of economics. With large parts, if the pattern is already made, casting may prove to cost less than welding. However, with no patterns and only a small number of pieces required, the cost of pattern equipment is not justified. On the other hand, if there is a large demand for a part, and a portion of the pattern cost may be added to each casting, welding may be relatively higher in cost.

The ultimate aim of an organization should be a design in which advantages of welding and casting are combined.

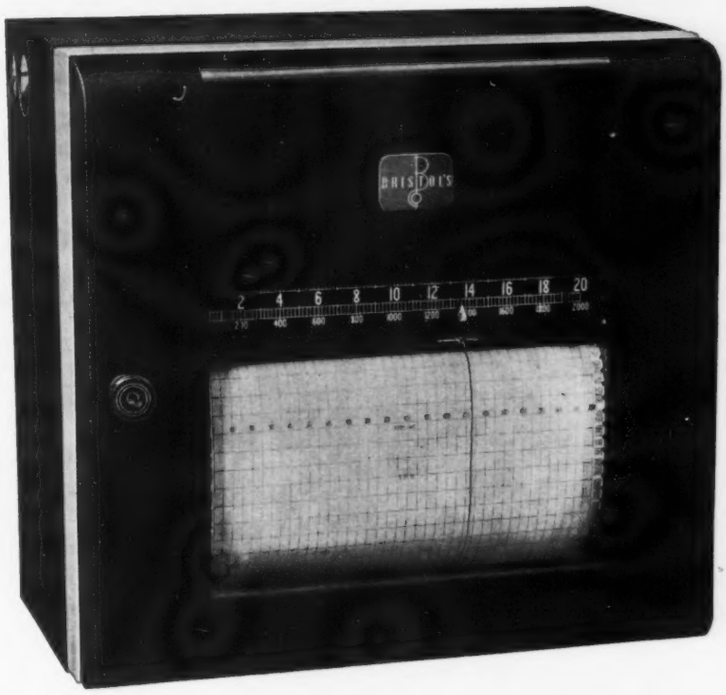
•

## Cuts Weight, Cost of Manhole Covers

Use of electric furnace iron instead of cupola iron in the manufacture of street manhole covers by the Atlas Foundry Company, Detroit, has resulted in a 30 per cent reduction in weight, an increase in shock resistance and a 25 per cent decrease in cost, it is declared.

These new covers are said to have a

# Industry Acclaims *this fine pyrometer*

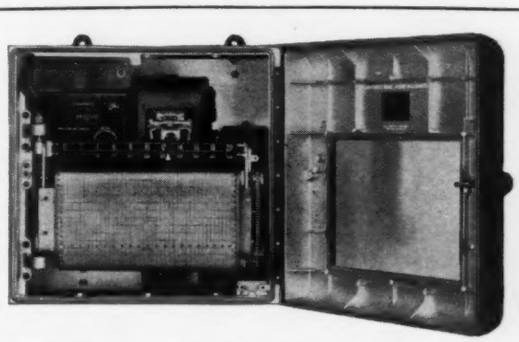



***Built by the pioneer makers of Pyrometers, this latest Bristol's sets a new standard in potentiometer design and craftsmanship***

Only a mere month or so has elapsed since this new Bristol's Wide-Strip Pyrometer was first announced at the Chicago National Metal Congress in October. Yet according to the ever-increasing number of enthusiastic reports that are coming in, it is the finest pyrometer ever presented to industry! Again Bristol design and craftsmanship have triumphed!

The use of a new principle in the balancing mechanism permits even the smallest deflections of the galvanometer to be measured and recorded. The pen responds promptly. Balance is quickly restored. Changing temperatures are speedily and accurately charted. Thanks to the elimination of back lash, lost motion, irregularities and the uncertainties unavoidable with friction wheels, ratchets and the like, this Bristol's sets a new standard in simplicity.

There are many features which merit careful appreciation. Besides the unusually wide strip chart, "far vision" indicating scale, heavy duty galvanometer, duplex slide wire, these are fully described in Catalog 1450 mailed on request. Write for a copy.



THE BRISTOL COMPANY • WATERBURY • CONNECTICUT

Branch Offices in Principal Cities. Canada: The Bristol Co. of Canada, Ltd., Toronto. England: Bristol's Instrument Co., Ltd., London, S.E. 14

# BRISTOL'S

TRADE MARK REG. U.S. PAT. OFF.

WIDE-STRIP POTENTIOMETER PYROMETER

tensile strength of 50,000 lb. per square inch, an elongation of 4 per cent and a Brinell number of 180 maximum to permit machinability. Controlled temperature and graphitization obtained in the electric furnace iron produces a tough, high-strength casting that will stand up much better under the shock of heavy traffic than the cupola iron covers. It is claimed that a properly annealed electric furnace iron cover will not shatter under extreme overload, but will simply sag and develop rib cracks, thus eliminating the danger of complete collapse and the resulting hazard of an open manhole.

•

## Heat Exactly Where It's Needed

In no other operation is the ability of electricity to put heat exactly where it is wanted more clearly shown than in heating rods for forging by passing current through the metal to be worked. Here is such a heater in the small parts plant of the Chevrolet Motor Company, Bay City, Mich., preparing steering gear rods for the forging press. The section of rod to be heated is held between heavy clamp contacts and short circuits the low-voltage secondary of a heavy-duty transformer. "Electric eyes" automatically cut off the current and release the clamps when the rods attain the required temperature.

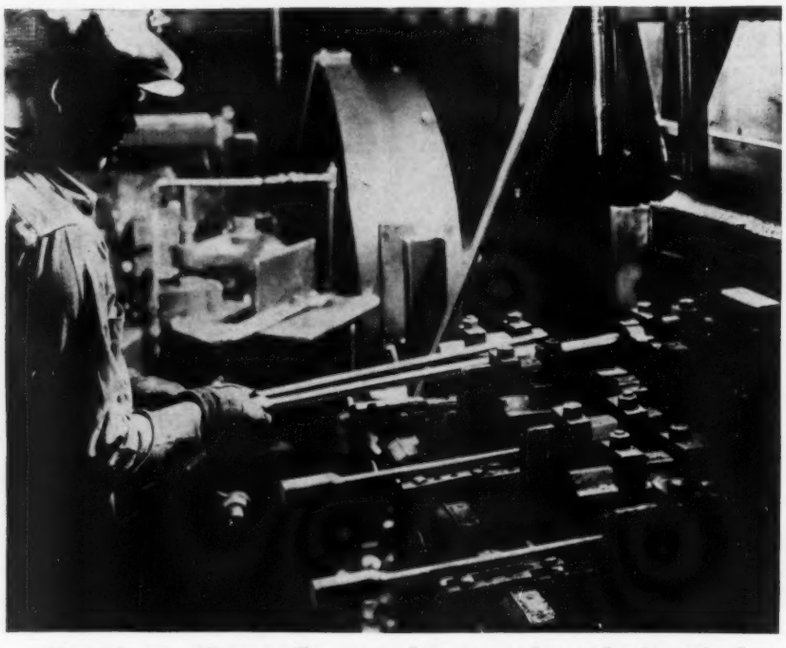


**Photo-electric cells cut off current when correct heat color is attained**

## Cofferdam Piling Welded Electrically

With the development of interlocking steel piling used in cofferdam construction came the demand for speed in erection as the projects became larger. Simultaneously, arc welding equipment had been developed sufficiently to enable it to step in and meet the requirements. A principal use for arc welding is to weld the sections of piling together end to end as driving progresses, where the depths are great and the piles cannot be driven as one piece. Or, if one long piece is driven and it buckles seriously in the process, an operator is quickly swung over the side, cuts out a section with a gas torch and then welds the two ends together when they are brought into abutment. Current for the arcs is supplied through cables from a portably mounted electric welding machine on the crest of the cofferdam, often 40 or 50 ft. above the operator.

**Welding steel piling sections on South cofferdam at Bonneville**

At Grand Coulee no less than twelve 300-amp. arc-welding machines are employed. Some, mounted on trucks, are out on the job, while others are used in the contractor's shop and welding yard.

•

## Accident Prevention in Maintenance Work

By A. C. SACHSE
Dodge Division, Chrysler Motors, Detroit, Mich.

The best way to prevent accidents is to anticipate their occurrence. Doing this discloses hazards that can be guarded against and thus the anticipated accident is fended off. Some of the hazards that will most quickly appear from the analysis of conditions surrounding electrical maintenance in an industrial plant and some of the obvious means for guarding against them are shown in the following classified lists:

**Hazards in Electrical Maintenance**

Shocks from contacts with "live parts."
Burns or eye injuries from arcing.
Burns from contacts with hot parts.
Injuries from fuse explosions.
Injuries from gas or dust explosions.
Blows from moving parts of switches or control devices.
Phase reversal. Unexpected starting. Overspeed.
Lack of provision for emergency stop.
Overtravel. Failure of power. Current overloads.

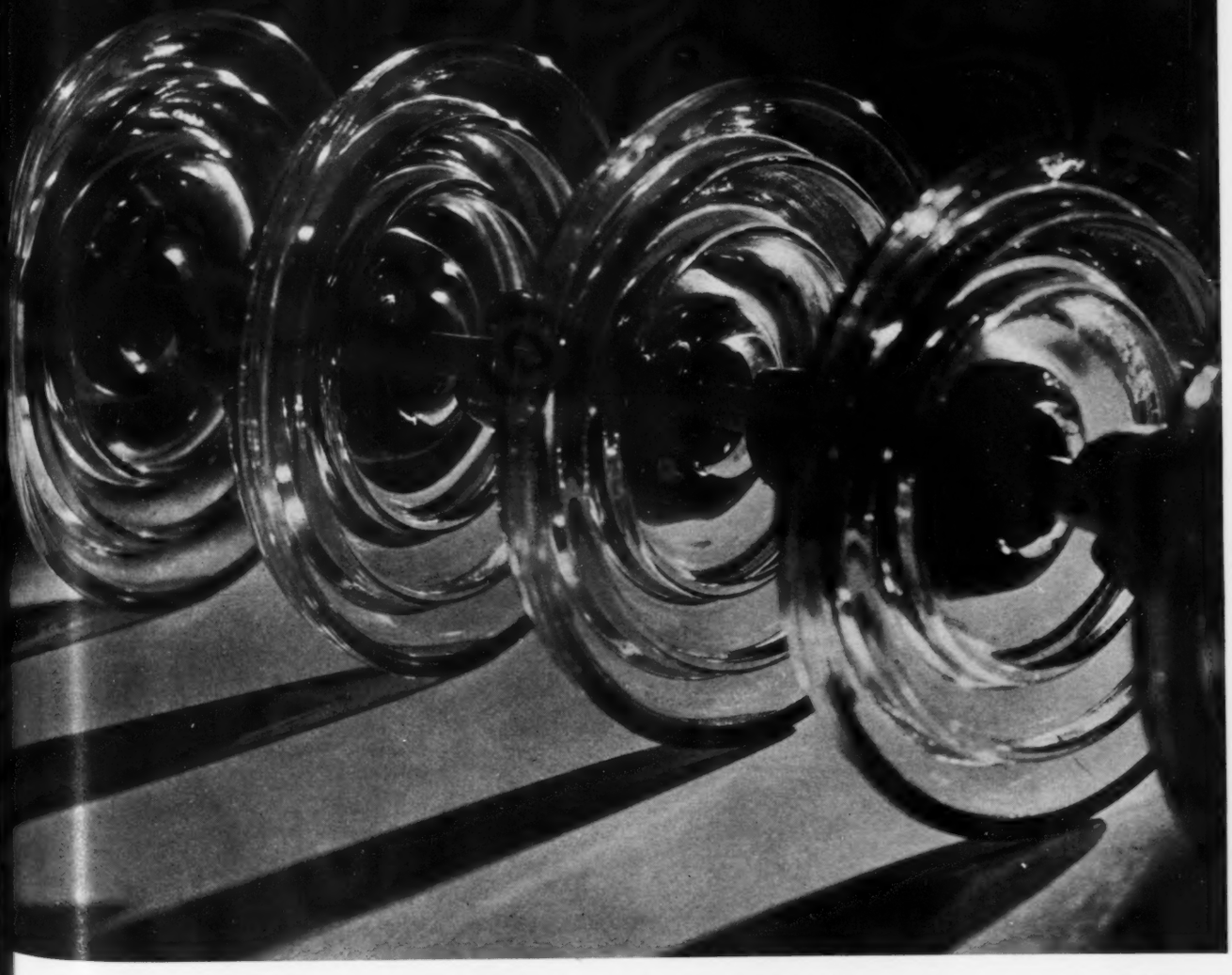
**Protections That Should Be Incorporated in Equipment Construction or Supplied by Associated Devices**

Inclosures. Proper goggles. Means for grounding.
Guards against unintentional operation.
Locking in "Off" position.
Undervoltage or low-voltage protection.
Overload protection. Phase reversal protection.
Means for disconnection from supply lines.
Limit switches. Emergency stop provisions. Overspeed devices.
Plain and understandable marking of equipment.
Design and arrangement of parts.

**Protections That Should Be Provided In Installation of Equipment**

Guards, inclosures, partitions, fences, etc.
Location for isolation.
Location for facility of operation, inspection and repairs.
Grounding through low resistances.
Insulating floors, platforms and mats.
Warning signs and alarms.

# ENDURANCE



# 20,000-Kw. Converter Cooled by Hydrogen

By S. C. TOWNSEND
Pennsylvania Power & Light Co.,
Allentown, Pa.

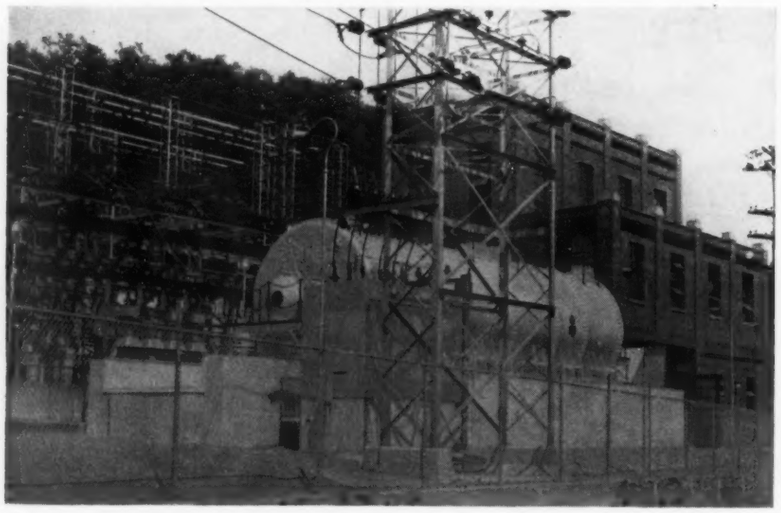
Recent installation by Pennsylvania Power & Light Company at Freemansburg substation of a hydrogen-cooled frequency changer constitutes the first commercial application of hydrogen to a slow-speed, two-unit set. Estimates having indicated that an air-cooled set in an outdoor steel housing would cost about the same as an outdoor hydrogen-cooled set, the latter unit was selected because of much lower losses. Also, due to a lack of oxidizing agents in hydrogen, there is an expected longer life of insulation and bearing oil, freedom from corona and practical freedom from fire damage.

The relatively low cost of the hydrogen set, in spite of its more expensive construction, is due to the greater heat transfer capacity of hydrogen, making it possible to use a smaller carcass and coolers than would be necessary for an air-cooled machine. General Electric Company rates this unit at 20,000 kw. in hydrogen and 17,500 kw. in air.

Deep well water at 52 deg. F. is supplied to eight hydrogen coolers and four bearing oil coolers. External water boxes at top and bottom of the coolers allow cleaning tubes during operation, while for tube replacements the coolers will be lowered into the pit under the machine. Cooling coils imbedded in the babbit of the bearings use oil circulated through surface coolers. Oil is used in preference to the more commonly used water, since should a leak develop the bearings are relatively inaccessible in the hydrogen-filled shell. Each bearing has its own complement of oil life and circulating pumps located in the pit. Excitation is supplied by a separate four-unit set. No frame shifter is provided with this machine.

A crane used during erection was removed and any major repairs will be done with the machine on the foundation. A system of beams and jacks is provided to support the rotor while the uncoupled outboard bearing and stator sections are being moved on small roller trains along the bedplate clear of the rotor winding. Any rewinding will then be done in place.

Acceptance tests run on the installed set indicate that the efficiency is above the manufacturer's guarantee and is very high for a frequency converter.



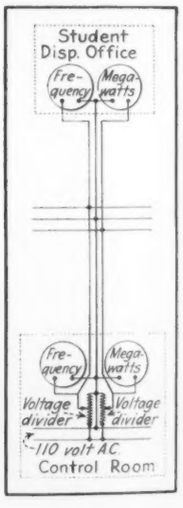
**Frequency converter augments utility supply to Bethlehem steel plants**
**20,000 kw., 0.9 p.f., 6.9 kv. (25 cycle) /12 kv. (60 cycle)**
This set, weighing 382 tons, is 15 ft. in diameter, 51 ft. 10 in. long and consists of six sections—two main annular rings containing stator windings and four containing bearings and hydrogen coolers. These sections are bolted together with additional end sections pierced for the collector ring extensions of the shaft, which together with the brush riggings are housed in separate compartments. Running carbon seals, when closed, cut off circulation from the main shell. The brush compartment may then be unbolted and brushes replaced under load. Class B insulation is used throughout and this feature allows the set to carry and emergency continuous overload of 15 per cent under rated conditions.

•

# Voltmeters Simulate Cycles and Megawatts

By A. P. BROADHEAD
Director, Dispatchers Institute,
Oneonta, N. Y.

For convenience and economy in instruction facilities we are using standard switchboard voltmeters as frequency and indicating megawatt meters. In the student dispatcher's offices throughout the institute, where frequency indications are essential, voltmeters are installed in appropriate locations. The voltage scales are replaced by scales reading in cycles. The meters are on circuits which radiate from the control board in the control room, where they are connected to the supply circuit. Each instrument circuit has a voltage divider inserted as shown in the sketch.




**Frequency and load indicated by standard voltmeters with modified scales**
Instruments in parallel calibrated to agree. Several student stations served in parallel off one three-wire circuit.

Some student offices have an indicating megawatt meter as well as a frequency meter, depending upon the network involved. The presence of the potentiometer in the circuit permits the "frequency" and/or the megawatts to be raised or lowered or a total

# ✓less stock investment

**is only one of the many money saving features you get with . . . .**

THE NEW LOCKE

# HI·TOP

## INSULATORS

**In addition to this reduction in cash outlay and warehouse space these insulators give you**

**. . . freedom from costly outages caused by dirt accumulations**

**. . . assurance of continuous satisfactory operation due to high mechanical and electrical values**

**. . . neat consistent appearance which will create good will with your civic organizations**

**. . . increased leakage resistance prohibiting the possibility of burned pole tops or crossarms**

**. . . and they cost no more than the insulators you are now using**

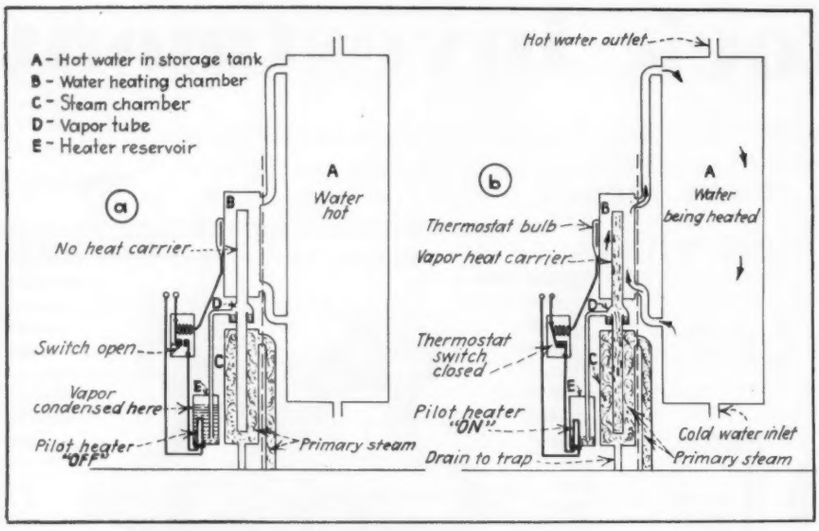
**. . . samples? Gladly.**

*If you have not already received your copy of this new Locke* HI-TOP *Insulator bulletin we'd like to send you one.*

# LOCKE

# PORCELAIN INSULATORS

LOCKE INSULATOR CORPORATION BALTIMORE, MARYLAND




**Schematic diagram of electrically controlled steam water heater**
(a) System at rest before operation of thermostat. (b) Vapor tube in operation.

interruption to be represented by the instructor in the control room as he sees fit, thus giving the student dispatchers in the various offices indications of the assumed status of his particular "system network." For instance, in case of a severe "system disturbance" produced by the control room operator, the frequency can be varied accordingly. The set-up, though simple, functions very satisfactorily.

•

# Electric Control for Steam Water Heater

A hermetically-sealed, electrically-controlled, heat-transfer system which utilizes water vapor as the heat-carrying medium to control the flow of heat from steam to water has made regulating valves unnecessary in a steam water heater recently developed at the General Electric Research Laboratories. Water heating, in this system, is controlled by inserting or withdrawing the medium carrying the heat from the steam to the water, thus the release of heat from steam, rather than the steam flow itself, is regulated.

The heater consists essentially of three parts, a steam chamber, a water heating chamber and a heat exchange and control system. Both the steam and the water heating chambers are cylindrical in shape, well insulated and separated from each other, with the water heating chamber located above the steam chamber. Running between the two and extending well into them is a vapor tube, sealed at both ends, but having a connection near the middle, from which a pipe runs to an externally located, uninsulated heater reservoir.

A small amount of water and a cartridge type heating unit are in the uninsulated reservoir. Turning on the heating unit heats the water in this reservoir. The resulting vapor pressure forces the water up in the pipe connected to the vapor tube. When the water strikes the hot tube extending into the steam chamber it flashes into vapor, which rises into the cool part of the tube extending into the water heating chamber. There heat is given up to the water and the condensate runs back down the tube to be revaporized and repeat the cycle, which continues until the water is heated to the desired temperature.

On reaching the desired temperature a thermostat turns off the heating element in the reservoir, which, being uninsulated, soon cools, reducing the vapor pressure and allowing the condensate to return to the heater reservoir instead of being forced to enter the steam-immersed tube. Thus, the heat carrier is removed from the vapor tube and no heat can be transferred from the steam chamber to the water heating chamber.

•

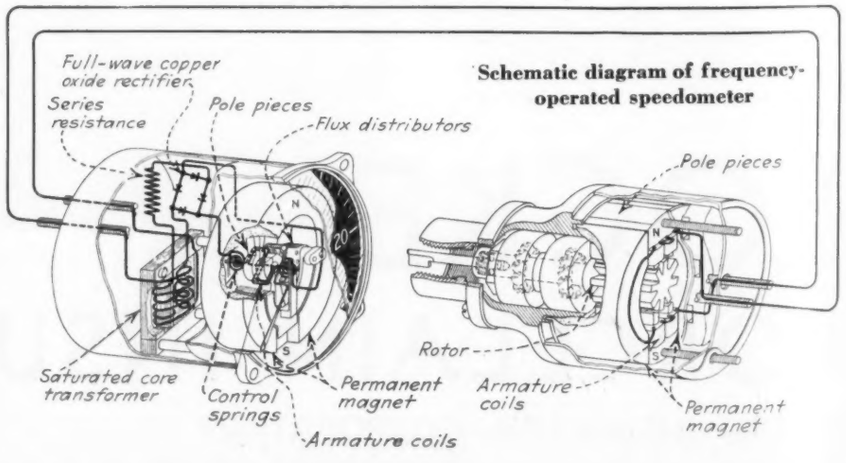
# Electric Speedometer Frequency Operated

By L. A. TAYLOR
General Electric Company

Operated from a simple inductor-type, a.c. generator to give an indication which is a function of generated frequency rather than voltage is a new electric speedometer which has been applied to locomotives and streamlined trains such as the Burlington "Zephyrs" and as a tachometer on airplane and railway type Diesel engines.

Frequency output of the generating unit, which is directly dependent upon engine revolutions, is conducted to the primary of a small transformer built into the rear of the indicating instrument case. The transformer is so designed that its core saturates at a voltage output given by the generator at less than 100 r.p.m. After saturation the voltage in the secondary coil is directly dependent upon the frequency of the primary coil. This a.c. voltage is then rectified to d.c. by a small copper oxide unit, also in the instrument case. The instrument is a simple d.c. millivoltmeter.

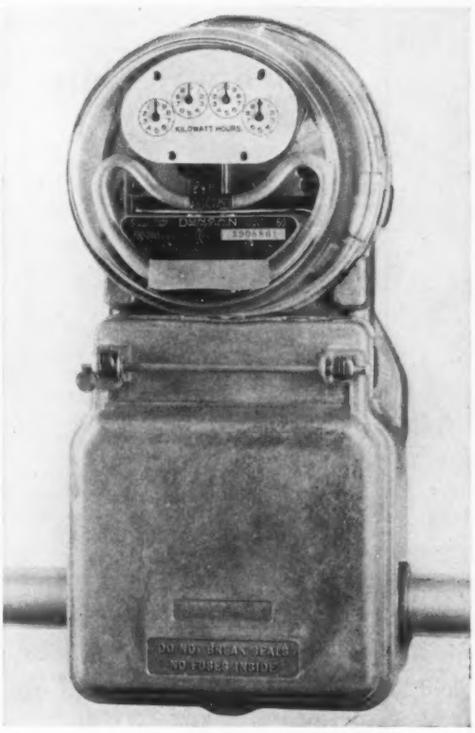
Since accuracy is not affected by length or resistance of connectors between the alternator and the indicating instrument the device is suitable for remote-speed indication. The generator may be keyed to the end of the axle, eliminating gears, belts and pulleys.



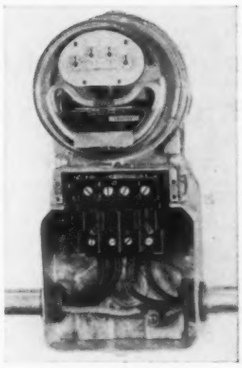

**Schematic diagram of frequency-operated speedometer**

# *NOW!*

# A NEW CONNECTION BOX
## *WITH SAFETY DISCONNECT BLOCK*
## FOR *TYPE A* METERS



*Duncan MF-A Meter with New Connection Box.*



*Installation View with Cover Removed.*

*Box with Sealing Top (Used When Meter Is Removed.)*

HERE is a new connection box with safety disconnect block to fit all Type A single phase watthour meters. This arrangement is weatherproof and makes a convenient and economical installation for outdoor metering or any enclosed service connection. The block mounted inside the connection box provides service disconnect and test facilities.

This new connection box is larger than the pull box which has been furnished for Type A meters, and the mounting bracket has been made an integral part of the box. The box and cover are aluminum die-castings, the box having breakouts in the back, bottom, and sides for $\frac{3}{4}''$, $1''$, and $1\frac{1}{4}''$ connections. Disconnect links are embodied in the bakelite block. This is a joint development of the meter manufacturers, and the new connection boxes and blocks can be used interchangeably with all Type A meters.

# DUNCAN ELECTRIC COMPANY
## LAFAYETTE, INDIANA

*MANUFACTURERS OF WATTHOUR METERS, DEMAND METERS, AND INSTRUMENT TRANSFORMERS*

# BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

## Twelve Months of Pump Sales

By J. W. HANCOCK
Division Manager Appalachian Electric Power Company, Roanoke, Va.

Our division of the Appalachian Electric Power Company includes the cities of Roanoke and Lynchburg, a number of towns and villages and thirteen counties. Each district has a technically trained rural service engineer, who acts in a consulting capacity in advising farm and other rural customers as to the best and most economical use of electricity. No charge is made for this service and these rural service engineers are not salesmen. They have to a large extent secured the confidence of these customers who call on them for assistance not only in connection with the use of electricity, but for advice in many other farm problems.

When a recommendation is made, they advise the customer as to where the particular equipment can be purchased and frequently, at the request of the customer, put him in touch with one or more dealers. In the case of an electric range or water heater (the only equipment we sell), the engineers explain that these may be purchased either through the company's commercial department or other dealers, and the prospect is turned over by him to our commercial department just as in the case of other dealers.

When the national running water activity was started about August, 1934, our rural service engineers contacted local electric pump dealers, explained to each rates, adequate wiring, correct installations and location of rural lines. The magazine *Electricity on the Farm* was widely distributed and talks were made by our engineers on running water systems at meetings in the rural communities. County agents were also interested.

For this twelve-month period ended June 24 the results shown in the table below were obtained.

| | Roanoke District | Lynchburg District | Totals |
|---|---|---|---|
| Total number of rural customers served as of January 1, 1935 | 4,130 | 1,549 | 5,679 |
| Estimated active prospects for running water systems | 1,000 | 650 | 1,650 |
| Number of sales reported by dealers | 186 | 79 | 265 |
| Estimated connected load (½ hp. per pump) | 93 | 39.5 | 132.5 |
| Estimated revenue from pumps sold (15 kw.-hr. per pump per month at 4 cents per kw.-hr.) | $1,339.20 | $520.80 | $1,860.00 |
| Estimated annual kilowatt-hour consumption | 33,480 | 13,020 | 46,500 |

•

## Sales Rallies Over Company Circuits

By W. L. FROST
Vice-President
Southern California Edison Company, Los Angeles, Calif.

Early this spring the Southern California Edison Company ran a refrigerator sales drive for twelve weeks, built around a comprehensive plan of cooperating with the dealers. The problem of maintaining the interest of all of the dealers in this large territory was solved by utilizing the utility's own communication circuits to hold long-distance sales rallies.

The company has several communication circuits to each of the key towns in its territory, and once each week a network was established for the purpose of holding sales rallies. Local dealers and their salesmen in each city were invited to dinner in a suitable hall in which a loud speaker was installed. The local organization of the Edison company acted as hosts for the evening. In this way the dealers' salesmen in twelve or fifteen cities could be addressed from the auditorium of the Edison Building in Los Angeles. There a microphone was set up and, immediately after dinner, a 45-minute program was "broadcast" over these direct-wire circuits.

The first half of the program was devoted to telling the audience about the progress of the campaign. Then came the records established by each district during the past week. The last half of the program was devoted to a talk by some merchandising authority on electric refrigeration. Prominent speakers were selected to make the weekly radio addresses. And representatives of southern California electrical wholesalers traveled through the territory for the local meetings in the various towns and cities and delivered sales talks based upon their personal sales experience.

The program proved most successful. Attendance at the local meetings exceeded 1,000 salesmen during each

## Coroner Calls for Light

Frank A. Nance, Coroner of Los Angeles County, recently wrote a letter to the Pacific Coast Electrical Bureau. He said:

California's highway system needs the protective feature of adequate illumination on main arterials, intersections and dangerous curves. Smooth highways, traversing all important sections of the Golden State, have already attracted world-wide attention, and it is now time to make them safer through adequate illumination in order to save life and limb.

It is hoped that we may increase safety on these highways for night driving by extending maintenance operation to include the illumination of main arterials in cities and towns and other populous areas. In the first quarter of 1935 70 pedestrians and 69 motorists were killed at arterial intersections in Los Angeles County. Highway safety is so important that its maintenance should be one of the first objectives of the State Highway Department.

High-speed highways need the correlation of every safety appliance that science and invention make possible in order that we may reduce the appalling number of fatalities on our California highways. Proper lighting has proved itself to be an effective and valuable ally in this campaign.

# 1935–FRIGIDAIRE'S MOST SUCCESSFUL YEAR

**A GREAT ACHIEVEMENT THAT SERVES NOTICE OF THE OUTSTANDING SUCCESSES THAT ARE TO FOLLOW**

IN 1935 more household Frigidaires were sold than ever before in a single year! . . . This spectacular accomplishment means a great deal—to you and to us. It proves that Frigidaire is more than ever the leader. It shows that we have the public's endorsement . . . that they believe in us. . . . But, what is of greatest importance is the fact that out of this tremendous success comes the experience for the most convincing, the most dramatic sales story ever told. From these outstanding successes we have discovered a new way to sell. It's the smoothest, fastest, straightest road to greater sales volume ever developed. Yes, we've learned a lot from 1935—and we've got the range for '36. Frigidaire Corporation, Dayton, Ohio.

*You'll do better with Frigidaire in 1936!*

of the twelve weeks of the campaign and the enthusiasm engendered by these frequent "get-togethers" has had a marked result in the success of the campaign, during which more than 12,000 refrigerators were sold. Using the company's communication circuits materially cut down the expense of maintaining this close contact between the utility and the local dealers.

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## Springfield Club Electrical Center

In Springfield, Mass., the United Electric Light Company has purchased a building formerly used by the Nayasset Club, one of the oldest and most respected in the city. It has been turned into a center for the promotion of electric service. The company itself sells no appliances and the old club building, well located downtown, therefore becomes headquarters for the dealers.

The building contains an auditorium, seating 200, for cooking schools, where eight ranges may be connected. There is a demonstration kitchen, an electric laundry, another auditorium for general meetings and other rooms for the demonstration of all domestic appliances and home lighting, as well as commercial and industrial heavy-duty equipment. The building is air conditioned and presents an attractive atmosphere for the many-sided story of modern electrical equipment for all uses.

The company maintains a large sales file in selling service in the domestic commercial and industrial fields and these men contact the contractors and dealers as well as customers. H. W. Lawrence, sales manager, is developing this service center as a place where the public may study all applications of electricity without encountering sales pressure and also as a supporting resource for the entire local industry. They may bring their customers there at any time for demonstrations and advice.

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## Business Waiting in the Breweries

Art Walker of the Nebraska Power Company says "Competition is becoming extremely keen in the brewery industry. Executives are very receptive to proposals for modernization. Intensive studies and surveys on steam-driven air compressors, ammonia compressors, beer and water pumps, line shaft drives, etc., will reveal high operating costs in many instances. By concentrating sales effort toward electrification at first on the most inefficient apparatus, positive results are assured."

**A corner in the old Nayasset Club, Springfield, Mass., where the public goes to see about electrical equipment**

**One of the demonstration kitchens in the new electrical center, where the local electrical industry takes its customers**

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## Two-Year Build-Up Backs Campaign

Union Electric Light & Power Company's fifth co-operative advertising campaign to aid local dealers in selling was started October 14 with a 450-line advertisement in three newspapers and radio, followed October 21 by two advertisements on specific appliances —the electric roaster and portable electric heater. A range advertisement is being run every week. Before Christmas there will be two large group-appliance advertisements.

This fall activity was prefaced by a special announcement to all dealers through the *Electric News*, which summarized the accomplishments of the last four co-operative campaigns—two solid years of build-up to create consumer acceptance and demand. These previous campaigns have included 386 advertising insertions in three St. Louis newspapers, 593,000 pieces of advertising material furnished dealers, thirteen half-hour radio programs and 400 billboards in selected spots.

Retailers and wholesalers were stimulated to put all their efforts into this fall campaign by quoting numerous reports from each class of the percentage increase they had experienced in business so far in 1935.

Range sales are now running about 3,000 per year, or five times 1934 volume. Although Union Electric sold 1½ ranges for every one sold by dealers in the first half of 1934, dealers' sales soared above utility sales in the first eight months of 1935. That's what the utility says it wants.

Refrigerator sales continue at a more rapid rate than in the country as a whole, dealers were told. In the greater St. Louis territory the increase of the first six months of 1935 over 1934 was 23.6 per cent and the Union Electric expects 30,000 refrigerators will be sold this year.

Thousands of sales of shades, portables, I.E.S. study lamps, bulbs and wiring are reported. One store reported the sale of more than 7,000 portables in six weeks.

More than 400 air-conditioning installations have been made in the last two years and the first eight months of 1935 have been the best of all.

The same friction, by which the Indian created a flame, caused the easy ignition of the first Friction Match made by the Frenchman, Dr. Chas. Sauria in 1831 . . . . This was a basic discovery that we still use today. But how obsolete a smudging flame now seems, in contrast with the immaculate cleanliness of Electric Heat. Mankind has an innate sense of cleanliness in relation to his food. Hence, the ever increasing demand for the Electric Range with ever growing revenue for the power companies which now get $130,000,000 annually from the domestic heating load . . . This was all made possible by A. L. Marsh in 1906, when he discovered Chromel, the wire that made electric heat possible. Heating elements of Chromel have the deserved confidence of the device maker and user. When you as an engineer recommend Chromel; or as a user, accept Chromel—your judgment is sound. Hoskins Manufacturing Co., Detroit, Mich.

H O S K I N S

# CHROMEL

THE *wire* THAT MADE ELECTRIC HEAT POSSIBLE

# MEN OF THE INDUSTRY

## J. B. Black New President of Pacific Gas & Electric

James B. Black, recently elected president of the Pacific Gas & Electric Company, to succeed the late A. F. Hockenbeamer (ELECTRICAL WORLD, November 23, page 45), is a former Californian with an experience of more than 23 years in the public utility industry, fifteen years of

J. B. Black

which were in operating positions and the last eight years principally in activities relating to financial matters. Since the acquisition by Pacific Gas & Electric Company in 1930 of the former California subsidiaries of the North American Company Mr. Black has been a director of Pacific Gas & Electric Company and in close touch with its affairs.

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▶ CHARLES F. SCOTT, professor emeritus of electrical engineering, Yale University, was elected chairman of the Engineers' Council for Professional Development at the third annual meeting of that body held recently in New York. Professor Scott succeeds C. F. Hirshfeld, chief of research of the Detroit Edison Company, who has served as the council's chairman since its formation.

▶ Gabriel Kron, a General Electric engineer, Schenectady, N. Y., has been made the recipient of an award of 10,000 Belgian francs as first prize in the competition sponsored by the George Montefiore Foundation of the University of Liége, Belgium, for the greatest contribution to the art and science of electrical engineering during the last three years. Mr. Kron's award was based on a memoir which he entitled "Non-Riemannian Dynamics of Rotating Electrical Machinery," and submitted some time ago. The first prize in the competition, which is international in scope, has not been awarded to an American since 1923, when it was won by J. B. Whitehead, dean of the engineering faculty, Johns Hopkins University. A native of Hungary, Mr. Kron is a graduate of the University of Michigan.

▶ ALEX D. BAILEY, assistant chief operating engineer of the Commonwealth Edison Company, has been elected vice-president of the American Society of Mechanical Engineers. He took office at the annual meeting of the organization this week. Mr. Bailey was formerly manager of the national society.

▶ SAMUEL ETTINGER has been appointed secretary of the Pennsylvania Public Service Commission to succeed Wendell Y. Blanning, resigned.

▶ C. F. BURGESS has been elected to the recently created position of chairman of the board of the C. F. Burgess Laboratories, Inc., Madison, Wis. ARBA B. MARVIN, participant in the organization of the laboratories, and attorney for more than twenty years, has been elected president.

▶ CLARENCE A. MAYO, manager of the Eastern Massachusetts Electric Company, Salem, the wholesaling transmission organization of the Tenney utility properties north of Boston, has also been made assistant manager of the Beverly Gas & Electric Company. CHARLES B. HODGSON, manager of the Beverly company, has recently been made assistant manager of the Salem Electric Lighting and Salem Gas Light companies.

▶ EARL H. BARBER, formerly electrical engineer of the Massachusetts Gas and Electric Light Commission and of its successor, the Massachusetts Department of Public Utilities, and recently special commissioner to investigate the advantages and disadvantages of public ownership in the District of Columbia, has been appointed a member of the engineering staff of the Rural Electrification Administration, with offices at Washington, D. C.

▶ MERVIN S. COOVER, recently appointed head of electrical engineering at Iowa State College, came to that position from the University of Colorado, where, beginning as instructor in 1919, he had become professor of electrical engineering in 1930. Mr. Coover graduated from Rensselaer Polytechnic Institute in 1914 and from then until his army service in 1918-19 was engaged in electrical construction work in New York, Montana and Kansas. He has been active in the American Institute of Electrical Engineers and in the Society for the Promotion of Engineering Education.

## J. L. Busey Named President G.E. Supply Corporation

J. L. Busey, who assumed the presidency of the General Electric Supply Corporation last month, is now responsible for one of the largest distributing organizations in the world. With 23 main houses, eleven local houses and 63 branches, it furnishes distributing channels for numerous lines of General Electric products, including apparatus, construction materials and electric appliances for both industry and the home.

Mr. Busey became identified with General Electric Supply Corporation in 1929 as New England district manager. He served successively as appliance sales manager and general sales manager. In 1932 he was appointed manager of appliance sales of General Electric's mer-

J. L. Busey

chandise department, continuing in that position until his recent election to the presidency of the G. E. Supply Corporation.

Before joining General Electric interests in 1929 Mr. Busey was identified with the Capital Electric Company, Butte Electric Supply Company and the Pacific States Electric Company.

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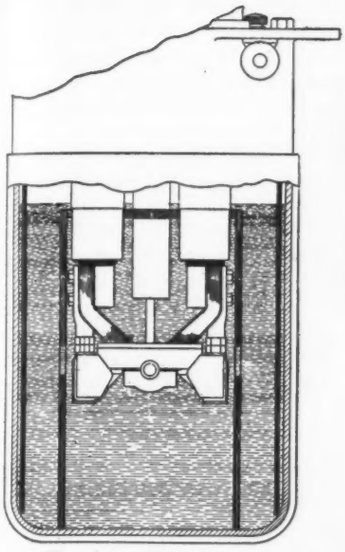
▶ D. G. EVANS, electrical engineer Wisconsin Gas & Electric Company, Racine, has been appointed assistant manager. He has been with the company since 1919.

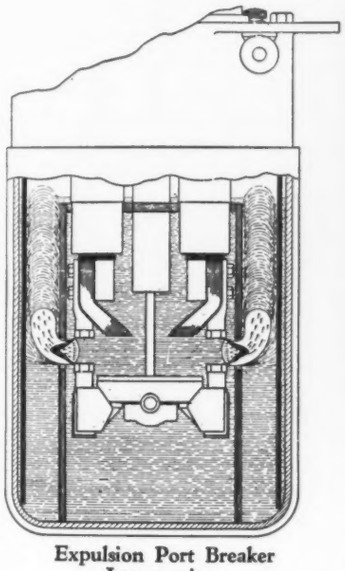
▶ A. L. POLLARD, assistant general superintendent of light and power and superintendent of steam heat of the Puget Sound Power & Light Company with headquarters in Seattle, has been named general superintendent of light, power and steam heat, following the consolidation of his two former positions. Mr. Pollard, who went to Seattle in 1930

# Armorclad Switchgear with Expulsion Port Breakers . . . .

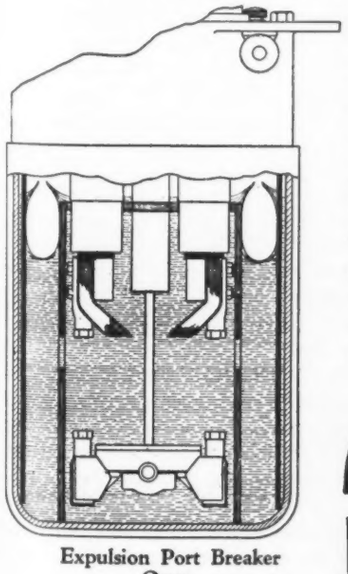
★ Less Arcing Time
★ Lower Maintenance
★ Wider Application



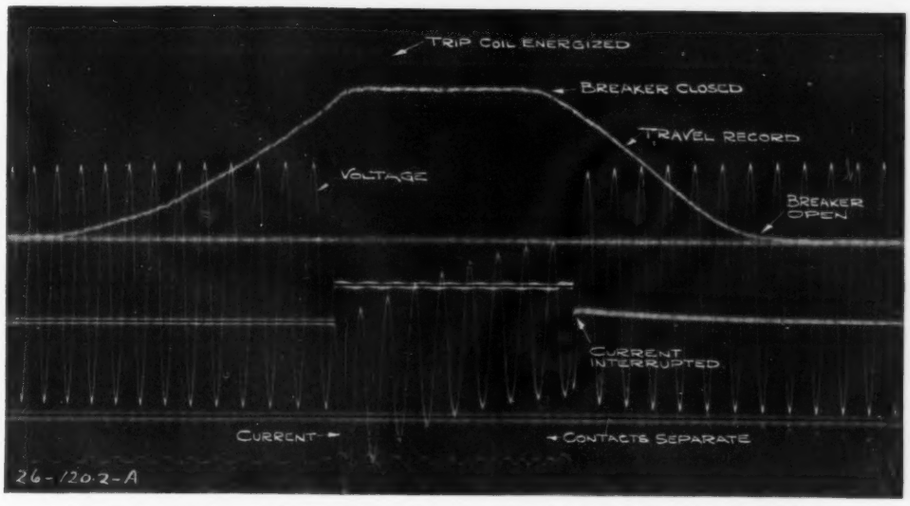
Expulsion Port Breaker Closed.



Expulsion Port Breaker Interrupting.



Expulsion Port Breaker Open.




Typical Oscillogram of Short-Circuit Test on Expulsion Port Oil Circuit Breaker.

**As a result of several years of testing and experimental work in our high power short circuit testing laboratory, Allis-Chalmers engineers have developed an improved type of oil circuit breaker for use in Armorclad Switchgear. This Expulsion Port Breaker, although not differing greatly in mechanical construction from previous Allis-Chalmers designs, has incorporated in it an arc extinguishing principle, illustrated at the left, which makes it very much more efficient.**

**Armorclad Switchgear combines into one metal encased, compound filled, factory-built and assembled unit, all of the necessary apparatus to make a complete three phase oil circuit breaker installation. Its safe operation, compactness and reliability have appealed to builders of power plants, substations, industrial plants and office buildings . . . and being of unit construction, completely assembled, it is easy to install. For bulletin write to Allis-Chalmers Mfg. Co., Milwaukee, Wis.**

**ALLIS-CHALMERS**

**REYROLLE SWITCHGEAR**

from the Boston offices of Stone & Webster, where he was a power engineer, succeeds Magnus Crawford, who becomes assistant chief engineer.

•

## S. D. Fitzsimmons Resigns from Narragansett Utility

Samuel D. Fitzsimmons, vice-president in charge of sales for the Narragansett Electric Company, Providence, R. I., during the past five years, has resigned to enter private business. In his new field he will be located at Providence and will devote his attention to load building and stabilization of the market for electrical appliances, working in cooperation with both manufacturing and utility interests. Mr. Fitzsimmons is widely known in both engineering and commercial fields.

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## New England Power Allocates Executive Duties

Several important administrative and operating changes in the executive offices of the New England Power Association at Boston have just been announced. William C. Bell, vice-president, becomes chief executive of a new bureau with supervision over certain activities of all retail gas and electric companies in Massachusetts, New Hampshire, Vermont, Connecticut and Rhode Island. These activities will include rate studies, matters affecting regulation, hearings before public authorities, power sales, merchandising, sales promotion, etc. Frank L. Ball and John West are designated as regional executives with managerial functions over groups of operating companies aligned by districts.

Mr. Ball's territory includes the North Boston Lighting Properties, formerly a part of the Tenney group, and the northeastern district of the association, in which Lawrence and Lowell are the principal communities. Mr. West's jurisdiction embraces the remainder of Massachusetts, with Quincy, Fall River, Worcester, Northhampton, Gardner and North Adams the principal communities in his district. Messrs. Bell, Ball and West report to C. S. Herrmann, president. Thomas H. Carens, who has been assistant to the president of the association, has been designated as assistant to the chairman, reporting to F. D. Comerford, chairman of the board. Mr. Carens is also assistant to the president of the Edison Electric Illuminating Company of Boston, reporting to Mr. Comerford, who became head of that utility some months ago.

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▶ G. A. Mills, formerly field executive of the Middle West Utilities Company, Chicago, is now at Lawrence, Kan., as executive vice-president of the Kansas Electric Power Company.

▶ John D. Swain has been elected vice-president of Electro Metallurgical Sales Corporation. Mr. Swain has been vice-president of the Linde Air Products Company and Union Carbide Sales Company, which are other units of the Union Carbide & Carbon Corporation. He has been actively connected with these units for a period of twenty years.

•

## F. L. Hockensmith to Direct Electrical League

F. L. Hockensmith, for many years a recognized leader in southern California industrial affairs, has been named general manager of the newly organized Electrical Development League of Southern California. Mr. Hockensmith spent eighteen years with the B. F. Goodrich Company, the last eight of which he served in the capacity of district sales manager in Los Angeles for southern

F. L. Hockensmith

California, Arizona, New Mexico and El Paso, Tex. In the spring of 1933 he became district manager for the Rubber Manufacturers Association. The rubber industry established fourteen of these district offices in strategic points in the United States. His work in this connection was primarily market control and dealer organization.

•

▶ H. L. Welch, district engineer for the Mississippi Power Company at Hattiesburg, has been named division manager to succeed the late E. E. Armstrong.

▶ J. Purdon Wright, Baltimore, has been appointed general counsel to the Maryland Public Service Commission. He succeeds Richard F. Cleveland. The appointment was made by Gov. Harry W. Nice.

▶ Charles MacLennan, formerly connected with the meter and testing department of the Brooklyn Edison Company and for the past seven years load forecaster and member of the system dispatching department of the New England Power Company at Millbury, Mass., left the United States November 29 to join the staff of the Tata Power Company, Ltd., Bombay, India. He will engage in power sales activities in his new position.

▶ Henry S. Morgan and Robert C. Stanley have been elected members of the board of directors of the General Electric Company. Announcement was also made of the resignation of Thomas Cochran because of ill health. Mr. Morgan is a director and executive officer of Morgan, Stanley & Company, Inc. Mr. Stanley has been president of the International Nickel Company since 1922.

▶ F. J. Almgren, assistant engineer with the Alabama Public Service Commission for the past ten years, has been appointed to a position with the Securities and Exchange Commission in Washington.

▶ Paul D. Sowell has been appointed advertising and sales promotion manager of the Leonard Refrigerator Company. Mr. Sowell entered the electric refrigeration industry in 1928 as a retail salesman for the company's distributor at Little Rock, Ark. He served that company as sales supervisor, wholesale salesman and sales manager. In 1934 he joined the Leonard Refrigerator Company in the sales promotion department. Later he was made assistant to the advertising and sales promotion manager.

▶ P. B. Zimmerman has been appointed general manager of appliance sales of the appliance and merchandise department of the General Electric Company. The appliance and merchandise department was recently formed through the consolidation of the specialty appliance and the merchandise departments. R. J. Cordiner has been named manager of the radio sales division, G. J. Chapman manager of the specialty appliance sales division, D. C. Spooner, Jr., manager of the home laundry equipment and cleaner sales division and R. W. Turnbull manager of the traffic appliance sales division.

▶ Henry G. Wells has resigned as a member of the Massachusetts State Department of Public Utilities to enter private practice in the field of public utility arbitration. Mr. Wells was appointed to the commission sixteen years ago and is a past-president of the National Association of Railroad and Utilities Commissioners and past-chairman of the public utility law section of the American Bar Association, besides being a former president of the Massachusetts Senate. Richard D. Grant, a former Boston newspaper man and now secretary to Governor Curley, is slated to succeed Mr. Wells.

# THEY SPEAK FOR US

The reliability of Synthane is responsible for its use in naval gun control apparatus . . . You can assure equal reliability in your products by using the same dependable insulation . . . Synthane laminated bakelite.

SYNTHANE LAMINATED BAKELITE
SHEETS • RODS • TUBES
FABRICATED PARTS

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SYNTHANE
CORPORATION OAKS · PENNA

# For 25 Years—

## The Exide-Ironclads Have Set the Standard for Low Maintenance

WHEN the Exide-Ironclad Battery was first announced in 1910, it provided engineers with an entirely new conception of how dependable and trouble-free a battery for materials handling units could be.

Since that time, the Exide-Ironclad Battery has gained a reputation for practically taking care of itself. This fact is reflected in the notably low maintenance costs that invariably accompany an Exide-Ironclad installation.

From the standpoint of the electrical engineer, if a good battery did no more than save valuable time, it would be a highly desirable battery. But the Exide-Ironclad has reached its position of leadership by virtue of other important features as well. It was the first battery to combine all four of the essential battery characteristics—high power ability, high electrical efficiency, extreme ruggedness, and long life. It is a battery that saves not only time but money.

During the last twenty-five years, the soundness of the basic principle of the Exide-Ironclad positive plate construction has been proved in actual service. Consistent progress has come through refinement. Today, this battery offers greater freedom from trouble and requires less time and attention than ever before in its long, successful history.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
*The World's Largest Manufacturers of Storage Batteries for Every Purpose*
Exide Batteries of Canada, Limited, Toronto

**Exide**
**IRONCLAD**
**BATTERIES**
**WITH EXIDE MIPOR SEPARATORS**

"MIPOR," Reg. U. S. Pat. Off.


# OBITUARY

## Frank W. Hall

Frank W. Hall, vice-chairman of the executive committee of the merchandise department at the Bridgeport plant of the General Electric Company, died November 25 at his home at Shippan Point, Conn. He was 63 years old. A native of Lansing, Mich., Mr. Hall was 22 years old when he entered the electrical business as an employee of the Sprague Electric Company of New York. In 1905 he left this organization to join the Hammerschlag Manufacturing Company. Returning to the Sprague Electric Company in 1909, he served as manager of its Philadelphia

Frank W. Hall

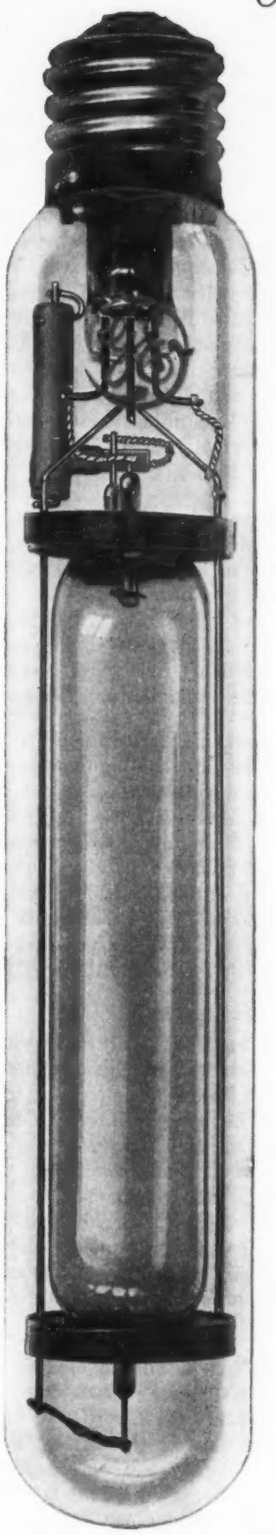
office, as sales manager of hoist equipment in the New York office and as sales manager of the apparatus division. When the organization was merged with the General Electric Company in 1918 Mr. Hall was made sales manager of the entire Sprague Electric Company.

He went to Bridgeport in 1922 as manager of the commodity sales division of the newly established merchandise department of the General Electric Company and the following year became manager of sales in the construction material division. He became vice-chairman of the executive committee of the merchandise department in 1933. At the time of his death he was a director of the General Electric Supply Corporation, the Trumbull Electric Manufacturing Company, Monowatt Corporation and the Rigid Steel Conduit Association. Mr. Hall was active in the National Electrical Manufacturers Association.

•

► THOMAS F. MALONE, one of the leading electrical engineers of Canada, died November 23 in Ottawa, in his fifty-seventh year. A native of Oswego, N. Y., Mr. Malone was employed by the General Electric Company and other electrical companies in New York State. He was identified with the Niagara Power Com-

# *Its Efficiency Starts with*



# 40 LUMENS

## *per watt*

The General Electric High Intensity Mercury Vapor Lamp provides industry with more light at lower cost than can be obtained in any other way. 40 lumens per watt, its rated output, permits long continued use of the eyes by workers.

This lamp makes available the inherent advantages of mercury vapor light with the new, added convenience of a standard Mogul screw base for vertical mounting with base-up. It is also made for base-down installation. The lamp has an average life of 2000 hours. It is self-starting on either 110- or 220-volt, 60 cycle circuits, with specifically designed General Electric ballast units.

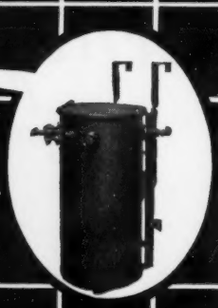
A new, sixteen-page booklet describes this General Electric High Intensity Mercury Vapor Lamp in detail. Write for your copy . . . General Electric Vapor Lamp Company, 805 Adams Street, Hoboken, New Jersey.

*Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Company.*

**GENERAL ELECTRIC VAPOR LAMP COMPANY**

664 Copr. 1934, General Electric Vapor Lamp Co.

# WATCH YOUR MAINTENANCE COSTS *Go Down*



*After* INSTALLING Wagner STUD-BUSHING-TYPE TRANSFORMERS

**Wagner stud-bushing-type transformers reduce maintenance cost, because:**

1. No replacement of leads is necessary when the transformers are removed from service—or are damaged in handling—or due to deterioration in service.
2. Porcelain bushings are designed with definite flashover values that will remain constant.
3. No trouble due to syphoning of oil.
4. Bushings can be easily and quickly removed without lowering transformer from poles or platform.
5. No soldering is necessary for connecting the transformer to the line.
6. Transformers are shipped filled with oil—prevents absorption of moisture by the coils while in transit.

T335-5

**Wagner Electric Corporation**

**6400 Plymouth Avenue, Saint Louis, U.S.A.**

TRANSFORMERS MOTORS FANS BRAKES


pany before going to Ottawa in 1926, where he took a prominent part in the formation of the Gatineau Power Company and was appointed general superintendent. Ill health forced his retirement in 1932.

▶ GEORGE T. BOGARD, vice-president and director of operations for the Kentucky Utilities Company, Louisville, died November 14, from injuries suffered in a motor accident. Mr. Bogard had been connected with the utility company since its organization in 1913. He was 48 years of age.

▶ ARTHUR W. CLARK, formerly vice-president of the Stone & Webster Corporation with headquarters in New York, and of General Refractories Company, Philadelphia, died November 8 in Philadelphia in his fifty-seventh year. Mr. Clark worked on many construction projects in various parts of the country, including the Conowingo Dam in Maryland and the Southern California Edison Company's plant at Long Beach, Calif.

▶ WILBUR L. LAFEAN, 52, president of the Naugle Pole & Tie Company, died at his home in Escanaba, Mich., November 15, after an illness of several months. Mr. Lafean was born at York, Pa. He was widely known in the electric and telephone utility fields, having for many years been identified with the pole business.

▶ MORRIS H. BENNETT, electrical engineer and inventor of highly specialized electrical devices manufactured by the Scoville Manufacturing Company, Waterbury, Conn., died October 28 in that city. From 1908 to 1913 Mr. Bennett was connected with the Edison Electric Illuminating Company of Brooklyn, N. Y., and for the past 22 years had been associated with the Scoville Manufacturing Company.

▶ DONALD E. CALLENDER, vice-president and general manager of the Wisconsin Gas & Electric Company, died November 10 at his home in Racine. Mr. Callender built up the Wisconsin Gas & Electric Company from a small local utility. Becoming local manager of the Racine Gas Light Company in 1909, he carried out a program of expansion which gave the company control of electric and gas services throughout the southeastern counties.

▶ HARLAN K. SCHEIBER, purchasing agent for the General Electric Supply Corporation, Salt Lake City, Utah, died October 16, of a heart attack, in his fifty-ninth year. A native of Crestline, Ohio, Mr. Scheiber transferred his interests to Utah and in 1895 joined Robert Nicol, who operated the Utah Electric Company. He had since been active in electrical merchandising, being in turn connected with the Salt Lake Electric Supply Company,

Capitol Electric Company and a number of branch stores in the intermountain region.

▶ ALFRED H. MCINTIRE, who for 23 years was editor and manager of the *Electric Journal*, published by the Westinghouse Electric & Manufacturing Company, died, of pneumonia, at his home in Pittsburgh November 4.

▶ FREDERICK J. MACLEOD, formerly chairman of the Massachusetts Public Service Commission and recently a Justice of the Superior Court in that state, died at the Deaconess Hospital, Boston, on October 18, following an operation. He was a native of Prince Edward Island.

▶ CLEYSON L. BROWN, president of the United Telephone & Electric Company, Abilene, Kan., died in Wilmington, Del., November 12 in his sixty-fourth year. In addition to heading the Abilene utility, Mr. Brown was president of a score of operating companies, chiefly in the telephone field.

▶ C. W. AMIDON, president and general manager of the Kansas Electric Power Company, Lawrence, Kan., was found dead November 25, in his garage, apparently the victim of carbon monoxide fumes. Mr. Amidon became head of the Kansas company in 1931. Previously he was vice-president of the Central Power Company, Grand Island, Neb., and prior to that was a member of the Central Illinois Public Service Company.

▶ SIR JOHN PYBUS, well-known British electrical enginer, died recently in London, following a long illness. He was 55 years of age. Sir John was managing director of the English Electric Company and a director of other electrical enterprises. In recent years he extended his interests to other industries, assuming various important directorships in the insurance and cement businesses.

▶ JOHN H. CAMPBELL, for 42 years president and treasurer of the Rhode Island Wire Works, Inc., Providence, died at his home in that city on November 11. He was born in Providence in 1855.

▶ DR. CARL SULZBERGER of Zurich, vice-president of the Swiss Electrotechnical Association, died recently while inspecting the new hydro-electric station at Dixence, Switzerland. Dr. Sulzberger, who was 71 years of age, was at one time connected with the Brown-Boveri Company and with the Allgemeine Elektrizitäts Gesellschaft in Berlin.

▶ J. C. DAVIDSON, manager of the electrical department of the Hendrie & Bolthoff Company, died October 15, after an illness of several weeks. Mr. Davidson was a charter member of the Electrical League of Colorado.


# *Effective* Illumination

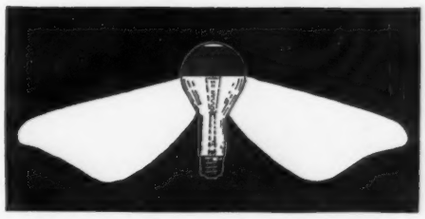
## Increased from 30% to 50%

**SILVRAY "MULTIPLEX" PROCESSING**

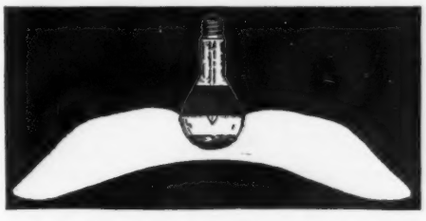
Silvray "Multiplex" Processing increases *effective* illumination from 30% to 50% . . . at an additional cost about equal to that of present lamp renewals.

With this process the light rays are controlled and directed without the use of separate reflecting devices or any other supplementary apparatus. Readily adaptable to all standard street lighting equipment . . . Silvray "Multiplex" Processing is the proven, tested plan to build up your street lighting load.

Write for details . . . or have one of our Engineers call with reference to a Survey or Recommendations. No obligation, of course.



Silvray "Special" B.D.C. Lamp (frosted). For base down-burning; symmetric distribution.



Silvray "Multiplex" B.U.S. Processing. Wide Range Symmetric Distribution. Base Up-Burning Position.

**AMERICAN STREET ILLUMINATING COMPANY**

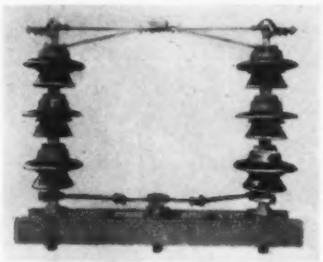
*"Backed by 57 Years' Street Lighting Experience"*

261 NORTH BROAD STREET . . PHILADELPHIA, PA.

# NEW EQUIPMENT

## Horizontal Break Switch

To secure a rapid effective break this switch has a blade consisting of two equal lengths contacting at the center point. Each half blade is carried on an insulator stack mounted on ball bearings. Blades open out on the same side of the switch and in the



"PM Form 2" 115/132-S kv.; assembled in three-pole combinations; motor or manually operated. **Delta-Star Electric Co.,** Chicago.

full open position are parallel and at right angle to the mounting base. Blades open at high speed, carrying the arc out into the air, which is not ionized. The arc is finally ruptured away from the field of the insulators, minimizing chances of ground flashovers.

•

## Hydraulic Pipe Pusher

Underground installations of pipe and conduit are quickly and easily made with this device without the necessity of tearing up pavements, sidewalks and lawns. One man can operate the tool, which is capable

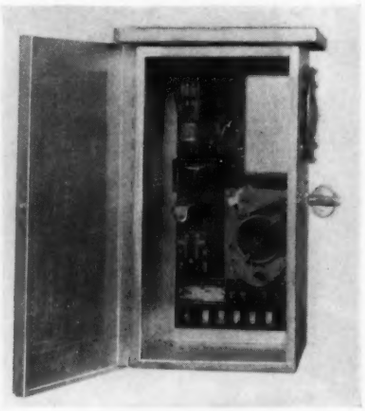
No. 790; has capacity for 3-in. pipe and smaller; weight 150 lb. **Greenlee Tool Co.,** Rockford, Ill.

of exerting pressures of 6,500 to 40,000 lb., against the pipe clamp. Eight speeds are available for varying soil conditions. Pipe clamps need be changed only every 4 to 7 ft., depending on the length of the rail used.

•

## Outdoor Lighting Control

Independent "on" and "off" adjustments are the most outstanding improvement in the new "Novalux" photoelectric relay for control of outdoor lighting equipment such as street lights, floodlights and signs. This relay can be adjusted to turn on or off at



Type CR 7505-H6; rated at 115 volts; may be operated at voltages between 125 and 105; dimensions, 20¾ in. high, 11¼ in. wide, 12¼ in. deep. **General Electric Co.,** Schenectady, N. Y.

any daylight intensity between $\frac{1}{10}$ and 10 foot-candles. Since each adjustment can be made separate from and independent of the other, an average burning schedule is possible that is equal to and perhaps less than that provided by the average definite-time schedule. Two phototubes in parallel behind a larger window provide the extended range which permits accomplishment of any reasonable schedule.

•

## Control for Rocking Furnace

Type AR-1 control; can be applied to Detroit furnaces over 200-lb. size. **Detroit Electric Furnace Co.,** Detroit.

Automatic control of the rocking cycle of this make electric furnace is provided by a new control feature. This feature enables the furnace operator to predetermine and repeat the rocking cycle which is advantageous metallurgically and thermally for the metal being melted. It also makes it possible to bring the furnace to the full rock in the shortest time so that the charge can be rapidly melted. The rocking cycle can be recorded on a log together with data as to composition, power input and weight. A set of dials on the control indicates the location of the door as rocking starts, the initial angle of rock, time duration at the initial angle of rock.

•

## Detachable Cable Connector

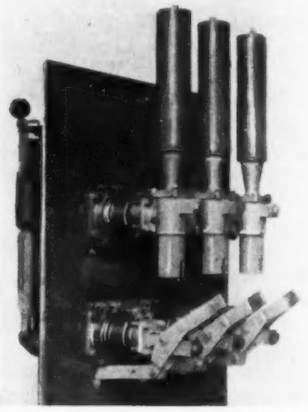
Designed for use in joining welding or electrode cable, this connector locks in position and cannot work loose or accidentally

**Lincoln Electric Company,** Cleveland, Ohio.

be pulled apart. In operation the plug is inserted in the jack and a twist of the wrist locks the connection. To disconnect, the procedure is reversed. Protection against grounding is by fiber-insulating sleeves.

## Air-Blast Circuit Breaker

Complete operation in 0.015 second is a feature of this new air-blast circuit breaker. This breaker uses two different types of contacts—arcing and disconnecting—connected in series. When the breaker operates compressed air throws the arcing contact into its open position, contact travel being chosen with regard to easy arc extinction. As the arcing contacts open an inrush of



Available for indoor mounting covering the voltage range from 64 to 50 kv.; rupturing capacities 100 to 600 mva. **Brown Boveri & Co., Ltd.,** Baden, Switzerland, and New York City.

air blows the arc through a nozzle-shaped contact to the exhaust duct, enveloping it, absorbing its energy and extinguishing it. After current interruption the disconnecting contacts open under pneumatically positive motion, giving visible disconnection.

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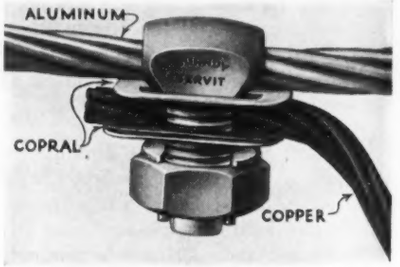
## Solderless Connector

Electrolytic corrosion that sets in when aluminum, in contact with copper, is exposed to atmosphere is said to be avoided in this duralumin connector fitted with bi-




"Servit," available for popular sizes aluminum and A.C.S.R. conductors. **Burndy Engineering Co.,** New York City.

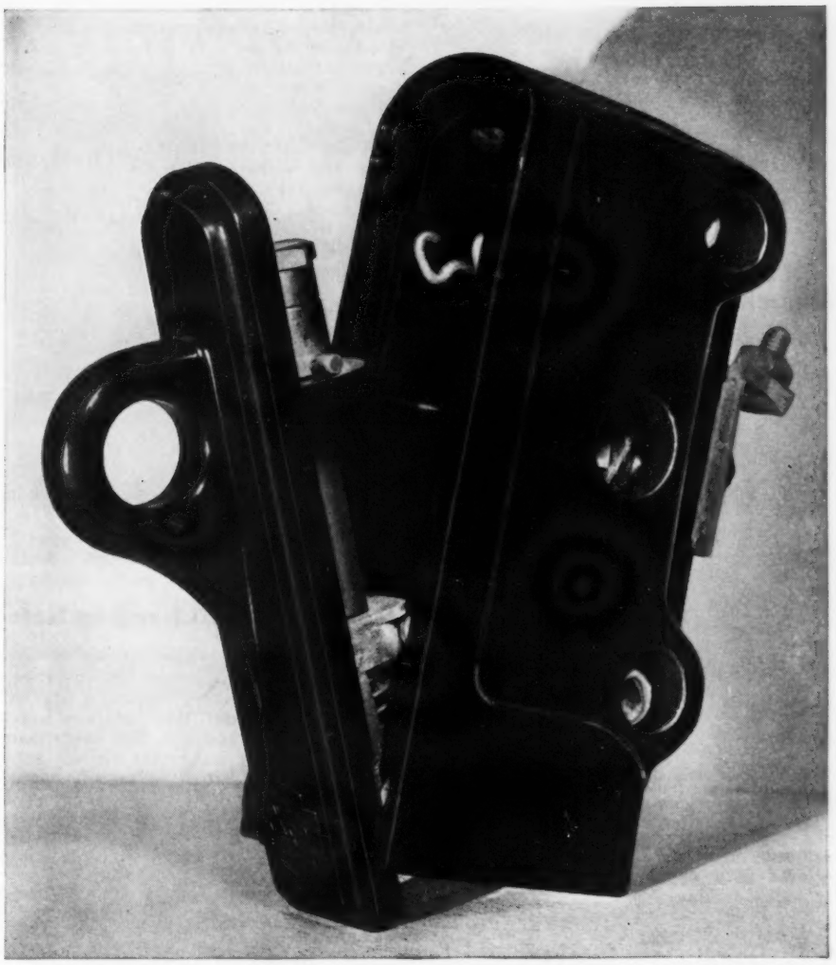
metal washers. These "Copral" washers are made to fit around the copper cable with the copper faces surrounding the copper cable and the aluminum faces in contact with the aluminum conductor. A nut-and-pressure bar clamps the cables, which are set in a U-bolt. The special forging process used is said to retain the full strength of the material from which the connectors are made.

★

# For Strength and Insulation

## *durable Bakelite Molded!*

★



DOOR PANELS of modern automatic cutouts must be both multiple-function and multiple-resistant! They serve not only as doors to protect cutout elements, but also as sturdy mounts for spring-operated opening mechanisms and as insulating shields to safeguard linemen. They must resist weather; sudden temperature change; electrical leakage; and mechanical shock.

To meet this difficult schedule of requirements, Bakelite Molded proved unusually useful in the design of the improved Tripomatic Cutout, pictured here. The strength, non-warping qualities and rugged durability of this versatile material contribute new dependability and longer service life. Its insulation value meets the highest electrical and safety requirements of cutout specifications.

Everywhere throughout the electrical industry today, the unusual combination of properties available in Bakelite Molded is opening new opportunities to improve the design and performance of equipment, devices and appliances. In the majority of instances, substantial production economies also can be realized.

Careful study of your own products may reveal limitations or disadvantages in former designs which can be completely overcome by use of Bakelite Molded. We will be glad to cooperate with you.

For further information on this useful modern material, write for our illustrated descriptive booklets 3M, "Bakelite Molded" and 3L, "Bakelite Laminated".

Photograph shows the Tripomatic Automatic Fuse Cutout with door of Bakelite Molded and Bakelite Laminated Cartridge. Made by James R. Kearney Corporation, St. Louis, Mo.

BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

1910 — SILVER ANNIVERSARY — 1935

**BAKELITE**

REGISTERED U.S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the symbol "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES

## Suspension Fuse

Hooked to the primary line of a distribution system with "hot line tools" and connected to transformer primary, this suspension fuse provides protection for rural line transformers. It employs a spring cable assembly and standard universal fuse links. Spring is normally under tension. When a fault occurs and the fuse link melts the coil spring instantly collapses and establishes a safe air gap between the terminals. The entire assembly is contained in a fiber-lined bakelite tube.

**Schweitzer & Conrad, Inc.**, Chicago, Ill.

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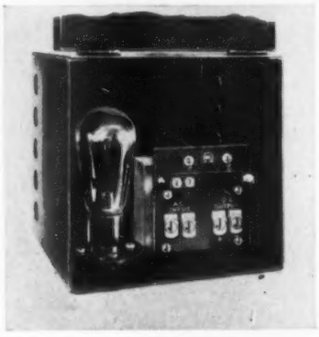
## Magnetic Chuck Rectifiers

This rectifier is used with magnetic chucks to provide a means for obtaining rectified alternating current from regular 110-volt circuits. A full-wave rectifier tube



Four sizes available covering range of 1,800 watts. **Ward Leonard Electric Co.**, Mount Vernon, N. Y.

is used with an average life said to be eighteen months. The complete unit is inclosed in a sheet steel cabinet arranged for wall mounting.

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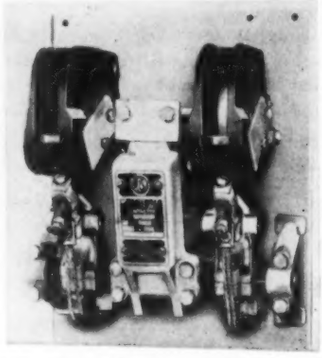
## A.C. Magnetic Contactor

Hum and chatter caused by uneven meeting of pole faces is said to be eliminated



Type LTZ; 100, 150 and 300-amp. capacity; arranged in single, double and triple pole styles; terminal connections either front or rear. **Electric Controller & Mfg. Co.**, Cleveland, Ohio.

in these a.c. contactors by use of a full-floating, resilient armature, which also cushions the slam of the contacts on closing. Light-weight, quick-moving aluminum construction is used. The "line-arc" principle is employed to remove the arc from the contacts as soon as they start to separate. The arc is transfered to the arcing plate and blowout guard, where it is moved at high speed along these parts.

•

## Portable Test Unit

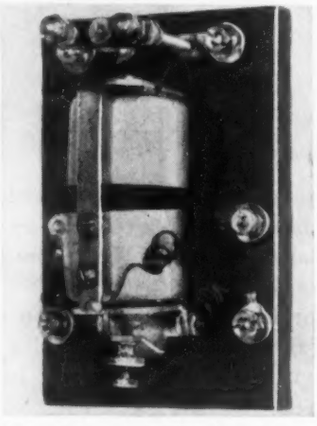
Suitable for general testing and laboratory use, this portable volt-ohmmeter simplifies the testing of circuit resistance, continuity and insulation. A d'Arsonval movement is provided in addition to selector switches for range selection. An accuracy of 2 per cent for d.c. volts and milliamperes and within 5 per cent for a.c. is claimed. The device is said to be most valuable in exploration and trouble shooting in complex circuits such as signal systems and control circuits where detailed knowledge of conditions and values must be obtained.

Several types available: single ohmmeters, volt-ohmmeters, d.c. test units and multi-scale a.c.-d.c. units. Type PM-32 a.c.-d.c. shown. Weight 2 lb.; dimensions, 7x4x3½ in. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

•

## Relay Controls Charging Rate

Batteries used in generating stations and substations to provide direct current for operating circuit breakers frequently are left on trickle charge until they require a heavy charging rate. Transfer is then made manually. This relay makes the change automatically. When battery voltage is normal



Relays pick up at 24 volts; drop out with 2-volt drop; resistors in series with coils permit operation on 4-volt drop on 48 volts and 12 volts drop on 132 volts. **Struthers Dunn, Inc.**, Philadelphia, Pa.

the relay armature is picked up, opening a contact which inserts a resistor in the field of the battery-charging generator, placing the battery on trickle charge. As the battery voltage drops the relay armature drops out, closing the contacts that shunt out the resistance and place the battery on full charging rate.

# ENGINEERING DATA FROM MANUFACTURERS

**Bulletins and catalogs now available to engineers by manufacturers and associations**

"Lubrication of Bearings in Electrical Machinery," bulletin L-10, of the Imperial Electric Company, Akron, Ohio, gives on one page a number of helpful hints on the proper care of bearings on electrical machines.

High-Capacity Type C Fuses is the subject of bulletin No. 200C issued by Schweitzer & Conrad Inc., Chicago. Construction, operation and application are covered and dimension and ratings included in three pages.

Steam booster compressors and condensate return units are described and their application illlustrated in two leaflets announced by Worthington Pump & Machinery Corp., Harrison, N. J. Dimension and rating data are included.

Dimension and rating data of wire type and multi-point contact, indoor disconnect switches are given in bulletin 222-A (three pages) of Schweitzer & Conrad Inc., Chicago.

Uses, properties and characteristics of "Koroseal," a new synthetic rubber compound, are listed in a twelve-page bulletin (No. 1050) available from B. F. Goodrich Co., Akron, Ohio.

A ten-page booklet available from Boston Woven Hose & Rubber Co., Cambridge, Mass., is devoted to advantages of a new process for continuous vulcanization of transmission belting which is said to be the most important improvement in manufacture during the life of the industry.

"Notes on Bethlehem Alloy Steels" is the title of a 14-page booklet published by Bethlehem Steel Company, Bethlehem, Pa., which covers briefly the uses and properties of manganese steels, chromium steels, nickel-chrome steels, molybdenum steels, chrome-vanadium steels and silico-manganese steels. Physical property charts for each alloy are included.

"How to Choose A.C. Incinerator-Crane Equipment" is a technical leaflet announced by the General Electric Company. Designated as GFT-683, it is intended to aid the consulting engineers in preparing incinerator specifications.

Time switches, types T-17 and T-27, are described and their application outlined in a seven-page bulletin, GEA-1427D, available from the General Electric Company. Dimension data and wiring diagrams are used to clarify the description of these devices.

Telescoping and cable end bell "Isolators" are the subject of Bulletin No. 131 of Electrical Engineers Equipment Company, Melrose Park, Illinois. The "Isolator" is a disconnecting device which employs telescoping contacts inclosed in telescoping insulating bushings. The bulletin describes the direct application of the idea to oil circuit breakers, cable terminals, etc. Pictures, diagrams and sectional views make clear the operation of the device.

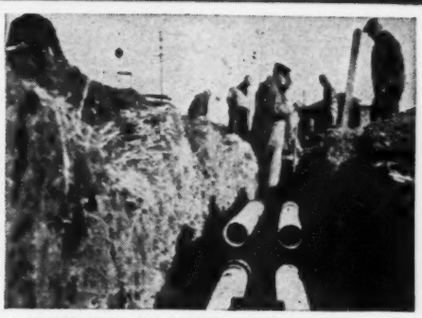
A recently announced 48-page catalogue (Form GI 4A-9-35) available from Johns-Manville, 22 E. 40th St., New York, lists and describes their industrial products in detail. Numerous drawings and photographs illustrate typical applications.

Ratings, dimension data, specifications and construction features of drop-out fused disconnects are included in bulletin 173 of the Southern States Equipment Co., Birmingham, Ala.

# Going "On Location" to prove the Superiority of JM Johns-Manville TRANSITE CONDUIT

**PERMANENT.** Transite Conduit, in use over railroad tracks, is unharmed by smoke and corrosive fumes. Edison Electric Illuminating Co., Boston, Mass.

**STRONG.** Transite Conduit's strength cuts installation costs for town of Belmont, Mass., by eliminating use of concrete envelope.



**LOW INSTALLED COST.** Light weight, long lengths, fast assembly save almost 50% installed cost for Staten Island Edison Co., N. Y.

**LOW COEFFICIENT OF FRICTION.** Cables pull through its smooth bore without damage. Pacific Gas & Electric Co., San Francisco.

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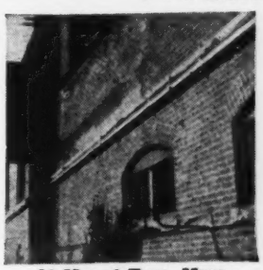
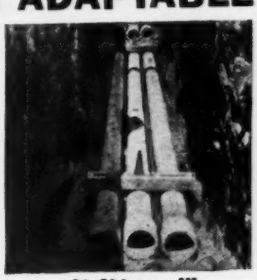
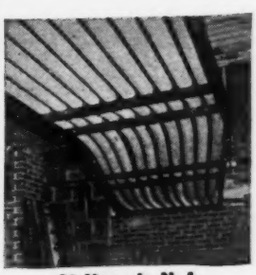
**INCOMBUSTIBLE.** Used in P.R.R. Tunnel under the Passaic River, Newark, N. J., Transite Conduit proves incombustible—highly resistant to arc.



**At Mount Tom, Mass.**



**At Chicago, Ill.**



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• The camera moves across the country, securing pictorial evidence of Transite Conduit's many advantages and adaptability to varying conditions.

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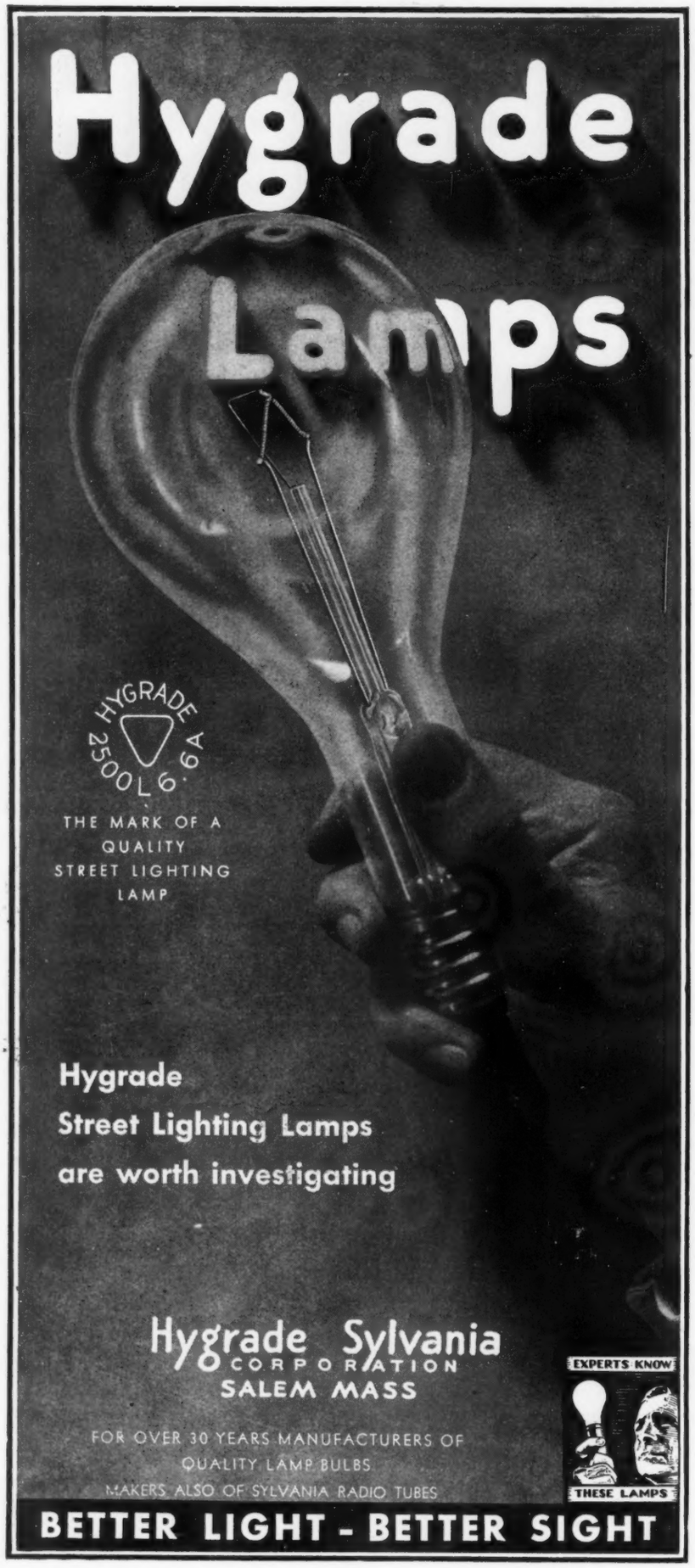


# BOOK REVIEWS

## *Steam Turbines*

By Edwin F. Church, Jr. Published by McGraw-Hill Book Company, 330 West 42d Street, New York. 319 pages, illustrated. Price, $3.

In the revised edition the author has adhered to his original determination to create a short but thorough text on turbines. The result is in no sense superficial; on the contrary, the discussion of design and functioning is dealt with quantitatively and based upon the mathematics of mechanics and thermodynamics. Chapters are provided on nozzles, on the preparation of blading diagrams and their proportioning, the control of losses, efficiency, reheat factor and condition line. A chapter on governing is followed by a final one on complete numerical design of 5,000-kw. impulse and reaction turbines and a 500-kw. non-condensing impulse turbine. A set of about 50 problems closes the book.

The treatment is modern and balanced. The author, however, devotes only one sentence to the mercury turbine and omits it entirely from the index.

•

## *Bethlehem Alloy Steels*

Bethlehem Steel Company, Bethlehem, Pa. Catalogue 107; 375 pages, illustrations, charts, tables; fabrikold binding, 6¾ x 9 in.

Essentially an engineers' handbook, this work was written to give users of alloy steels dependable working data on properties and performance and to bring all pertinent existing data on these alloy steels up to date in one complete volume. Production facilities and quality control of the Bethlehem Steel Company are covered in two brief chapters which precede the six main divisions, namely; (1) Grades of Steel; (2) Steels for Specific Uses; (3) Testing and Properties of Steel; (4) Working of Steel; (5) Definitions of Common Terms; (6) Tables and Useful Information.

One of the distinctive features that should prove useful and valuable to steel treaters is the color charts of heat and temper colors. On these charts the colors have been reproduced with unusual fidelity, corresponding to the actual colors observed on pieces of steel under accurate temperature control.

•

## *A Fugue in Cycles and Bels*

By John Mills. Published by D. Van Nostrand Company, 250 Fourth Avenue, New York. 269 pages, no illustrations. Price, $5.

Revolutionary change in the art of music is prophesied by the author because of the profound advances in sound generation, control and propagation which have come with the evolution of electron tubes. Orchestra conductors have, as a result, at their command the tools to mold their technique so as to produce subjective tonal effects which are not at all originated by any of the instruments under their direction. Shifts of pitch with enhanced intensity are a new "close harmony" potentiality indicated by electronic sonics. Likewise, the violinist, thanks to the auditory perspective function of microphones, knows now why he swings his instrument as he bows it—to compensate for its inherent directional effects. Music emerges from its one-dimensional limitations under the kind ministra-

tion of stereophonic audition. Maybe the director will resort to "volume dials," to enforce the vaguer implications of his baton.

For the electrical engineer, however, the virtue of this book lies in the remarkable assembly, in simple language, of the successive studies in electron tube, microphone, modulation, acoustics and transmission which have attended broadcasting and sound-picture perfection. Sound quality is treated in a quantitative way as never before. Thresholds are stripped of their uncertainties. Power of a heavy orchestra may hit a 70-watt peak, but the average may be only 1/10 watt. Most of the music disseminated is stated to fall within a 30-decibel range. The ideal electro-acoustical system should handle a 70-db range (10,000,000 to 1) without losing weak sounds or distorting the strongest (a lion's roar at 18 feet is about 87 db). The reader will be amused at the acoustical explanation of the Tower of Babel's bedlam rather than a confusion of polyglot tongues. All technical graphs and tabulations are segregated in the 40 pages of Part IV so that electronic virtuosos can find it compactly when they set out to remake music into a new art.

•

### *Check Sheet: Introduction of New Consumer Products*

By O. C. Holleran. Published by Government Printing Office, Washington, D. C. 51 pages, no illustrations. Price, $0.05.

Manufacturers who are considering the developing of new products for consumer use ought to find this discussion helpful to avoid pitfalls that might result in serious loss. "Practically all manufacturing executives can cite many cases of marketing failures caused by the great expenses of the introductory effort. Analysis shows that nearly every such marketing failure was brought about because certain important data were not adequately studied before production and marketing began. There are literally scores of studies which must be made if a new product is to be successfully placed on the market."

Specific examples are given of success resulting from proper evaluation of important factors, and of lack of success caused by neglecting them. Two check-sheets dealing respectively with marketing and production show, in condensed form, the studies needed by a manufacturer prior to a capital investment in the producing and marketing of a new consumer product. The publication appears as "Market Research Series No. 7" of the Department of Commerce.

•

### *Keystone Coal Buyers Manual*

Edited by Sydney A. Hale. Published by McGraw-Hill Publishing Company, Inc., Catalogue and Directory Division, 330 West 42d Street, New York, N. Y. Cloth-board covers; 458 pages; 8½ x 11½ in.; numerous maps, tables and illustrations. Price, $10.

Constituting an authoritative and detailed survey of the coal resources of the United States, this book provides extensive essential information of interest to industrial coal buyers, wholesalers, retail distributors and power plant engineers, pertaining to the origin, location, production, shipping points, railroads, sampling analysis, preparation, choice, selling agencies and personnel.

The book was conceived and executed by Sydney A. Hale, editor of *Coal Age*, aided by a distinguished staff of authorities. By far the major portion of the volume is devoted to a classification of the resources of the 25 coal-producing states taken alphabetically one at a time. Particular sec-


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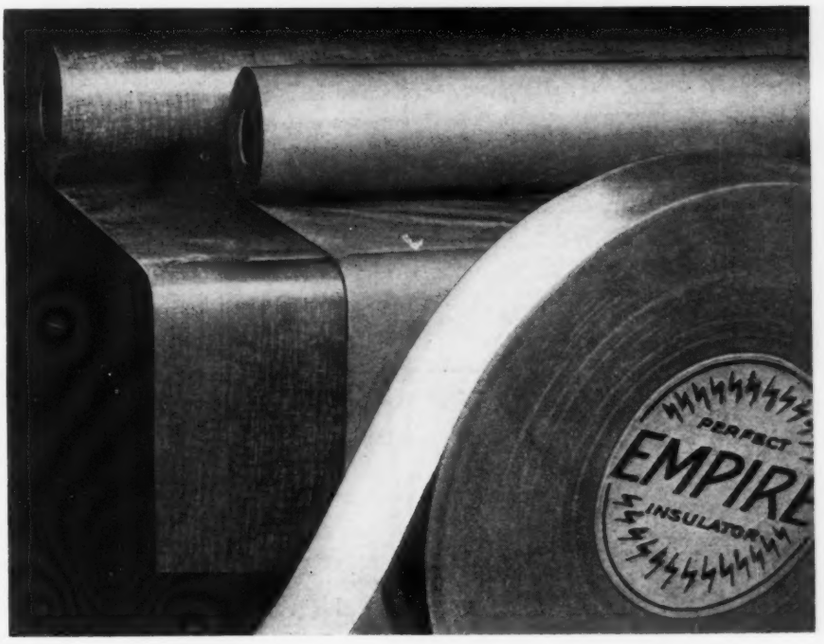


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tions cover (1) general outline and map of the coal fields of each state; (2) description of the mining districts, including location of the principal seams mined, character of the coal and uses for which it is suitable, sizes shipped and railroads serving the district; (3) alphabetical list of the principal seams mined, including the seam characteristics and range analyses; (4) directory of mines operating in the state, with official personnel, power data, size of mine seam worked and the railroads serving individual operations.

•

### *Praktische Physik*

By F. Kohlrausch. Published by B. G. Teubner, Leipzig & Berlin. 958 pages, illustrated. Price, 24 reichsmarks.

This is the seventeenth German edition of Kohlrausch's encyclopedic book, this time completely revised by Henning. It is again the authentic compendium of technique as it appears in apparatus and experimentation in all the branches of physics. Quantitative relations, tabular data, measurement methods are the primary content and pains are taken throughout to cite the sources of data and procedures. For research and development laboratories, even for those which call themselves dominantly electrical, this volume will be distinctly helpful because it assembles the tools and relationships that inevitably are wanted as soon as electrical experimentation encounters phenomena in mechanics, heat, light, gases, etc.

•

### *The Public Utility Question*

By H. G. Hendricks. Handled by American News Company, 131 Varick Street, New York. 148 pages. Price, $2.

Authority lies behind the analysis because the author wrote several sections of the report of the staff of the House committee on interstate and foreign commerce which held the hearings on the Rayburn bill. In the main, the material is a condensation and interpretation of the Federal Trade Commission report. The formation, structure and machinations of most of the holding companies, good, bad and indecent, are portrayed, with Associated Gas & Electric getting the major share of attention. Financial structures are contrasted and traced to the state laws, especially the Massachusetts act of 1894.

In spite of the fact that there are chapters on fleecing the investors and the customer, the book is not blindly in support of the Administration's political philosophy and attack on utilities. "Recently published utterance of some members of the Federal Power Commission are too obviously economically nonsensical and logically fallacious for serious consideration . . . there must be some virtuous utility holding company enterprises!" Mr. Hendricks refutes the idea that manipulation of holding company securities must mean raids on the operating company investors and customers. Samples of startling contradictions in the utterances of Messrs. Lilienthal and McNinch are set in juxtaposition. "Governor Roosevelt . . . predicated his charges on fallacies and consequently drew erroneous conclusion from them." Also, the Supreme Court "has lost itself in circular reasoning as to the value of the base property" because value and earnings are mutually dependent.

An author who can so lucidly sum what has been wrong on the utility side and what is manifestly wrong on the government side ought to be able to envision a right solution. Maybe he has one, but he left it out of the book.

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PERFECTLY SANE, ARCHIE, HE'S LOOKING FOR FLAWS!
IF THAT'S B.T.C. DROP FORGED HARD — WARE, HE'S WASTING HIS TIME. FORGINGS ARE UNIFORM. NO HIDDEN DEFECTS OR CONCEALED FLAWS.
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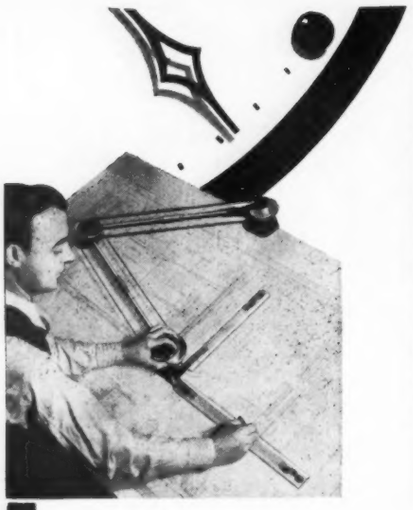

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# Recent Rate Changes

Milwaukee Electric Railway & Light Company inaugurated a new bargain electricity plan for residential, rural and commercial lighting customers, beginning with October. The plan, which will continue to June, 1936, applies to more than 225,000 customers and has been approved by the Public Service Commission of Wisconsin. Briefly the plan permits 100 per cent increase in use of service for only 10 per cent increase in cost and is called the "10 for 1" plan. Its principal features are: (1) Customers may use up to twice as much electricity as they did in the similar month of the preceding year at a cost not exceeding 10 per cent over the bill for the similar month a year ago. Energy in excess of double last year's amount is charged at the rate of 2 cents net per kilowatt-hour; (2) regardless of how little energy a customer used last year he is entitled to at least 30 kw.-hr. for 10 per cent increase in his bill; (3) whenever a bill at regular rates would be lower than under the bargain plan the regular rates will apply.

•

Montana Power Company reduced rates on domestic electricity 20 per cent and commercial lighting rates 17 per cent, effective November 15. Under an agreement with the Montana Public Service Commission, all suits against Montana Power by the commission will be dropped.

•

Carolina Power & Light Company has reduced its electric power rates to South Carolina consumers by approximately $183,000 annually, effective January 1, 1936. Of the total reduction, approximately $118,000 will be to residential consumers and about $65,000 to commercial consumers. In North Carolina the company made reductions, also effective on January 1 next, which will mean an annual saving of $600,000 to North Carolina consumers. The new rates eliminate all old domestic rate schedules and substitute a new block rate and a lower inducement rate.

•

South Carolina Power Company has been ordered by the state Public Service Commission to show cause before it December 11 why its electric power rates should not be reduced by approximately 22 per cent, which is calculated to save customers $300,000 annually. The proposed reduction would affect practically all classes of consumers except large power users.

•

Philadelphia Electric Company has announced plans for the reduction of its power rates to industries using untransformed energy in Ardmore, Chester, Jenkintown, Norristown and Philadelphia. Industries will save approximately $750,000 yearly.

•

Maryland Public Service Commission has instituted an investigation of the supply of electrical energy and the rates charged by the Susquehanna Power Company and the Susquehanna Electric Company to the Conowingo Power Company. It is explained by the commission that the investigation is to determine whether or not the two Susquehanna companies are fully meeting their charter obligations and the conditions laid down and imposed by the commission in January, 1926, authorizing and approving the corporate and financial plans and arrangements for the hydro-electric development on the Susquehanna River, known as the "Conowingo Project," in connection with the furnishing and supplying by the two companies of electrical energy to the Cono-


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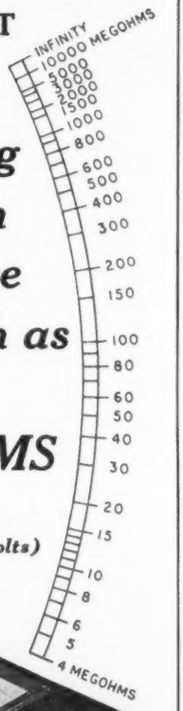


*(Hand generators develop 2500 volts)*

ONE Utility Company uses 10 of these high-range "Megger" sets. The instruments are assigned to various company divisions and maintenance crews, and are used for periodic tests of generators, transformers, bushings, insulators and other equipment on which it is safe to apply the 2500 volts d.c., which these sets generate.

By this relatively inexpensive procedure, many defects are detected in advance of failure and much unnecessary trouble is avoided. The company considers these 10,000-megohm "Megger" sets quite superior—especially in high tension work—to lower range "Megger" instruments.

*Please write for descriptive Catalog 1400-W*

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"Dionic" Water Tester
"Frahm" Vibrating-Reed Tachometers and Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

wingo Power Company for distribution and sale by the last-named company within the State of Maryland. The investigation also is to determine whether or not the rates charged for the energy furnished to the Conowingo company are just and reasonable.

•

Bangor Hydro-Electric Company has been ordered by the Maine Public Utilities Commission to reduce its fixed capital by $2,491,023 and to revise its rates within six months to remove "discriminatory charges" of $29,000.

•

Georgia Power Company's proposed reduction in industrial power rates was taken under advisement by the state Public Service Commission, following a hearing in Atlanta. The hearing was conducted by the commission following a rule *nisi* issued at the request of textile mills which claimed that present rates discriminated in favor of mills in other states. Protesting any further reduction in industrial rates, Preston S. Arkwright, president, stated that the company was making only a fair return on its investment and that the decreases proposed would place an undue burden upon his organization.

•

## Municipal Items

DELTA, COLO.—Temporary injunction has been issued in Washington restraining the P.W.A. from loaning money to the city for the purchase of the Western Colorado Power Company's property or for erecting a city plant. Voters in the November election approved of a municipal plant.

GLADBROOK, IOWA—City has renewed the franchise of the Iowa Electric Light & Power Company for twenty years.

LEMARS, IOWA—Citizens have defeated proposal to construct, maintain and operate a $400,000 municipal light and power plant. Project was to be financed out of earnings.

WAUKON, IOWA—Proposal that the city issue $175,000 of revenue bonds to finance the construction of a municipal light and power plant has been defeated.

INDEPENDENCE, KAN.—Tenth United States Circuit Court of Appeals in Denver, Colo., has denied a rehearing in the injunction suit of Kansas Gas & Electric Company, seeking to restrain the city from constructing a municipal light and power plant. The court ruled invalid the company's contention that lending and granting of funds by P.W.A. to municipalities for construction of projects was unconstitutional.

MANKATO, KAN.—Citizens failed by sixteen votes to attain the two-thirds majority necessary for approval of a revenue bond issue for construction of a municipal power and light plant.

FORT THOMAS, KY.—A proposed $200,000 bond issue for the purpose of building an electric light plant was defeated at the polls in the general election last month. With a two-thirds vote necessary for passage, final count showed 947 for and 2,530 against the proposal.

ABERDEEN, MISS.—Voters approved T.V.A. energy in a bond issue election held last month, vote 642 to 42. The city sold its plant and lines several years ago to the Mississippi Power Company. The election was for the city to issue bonds for $119,000 for the purpose of erecting its own distribution plant and lines and to secure T.V.A. energy.

NEBRASKA—Directors of the Central Nebraska (Tri-County) public power district have signed a loan and grant agreement with P.W.A. under which they will receive


Performance

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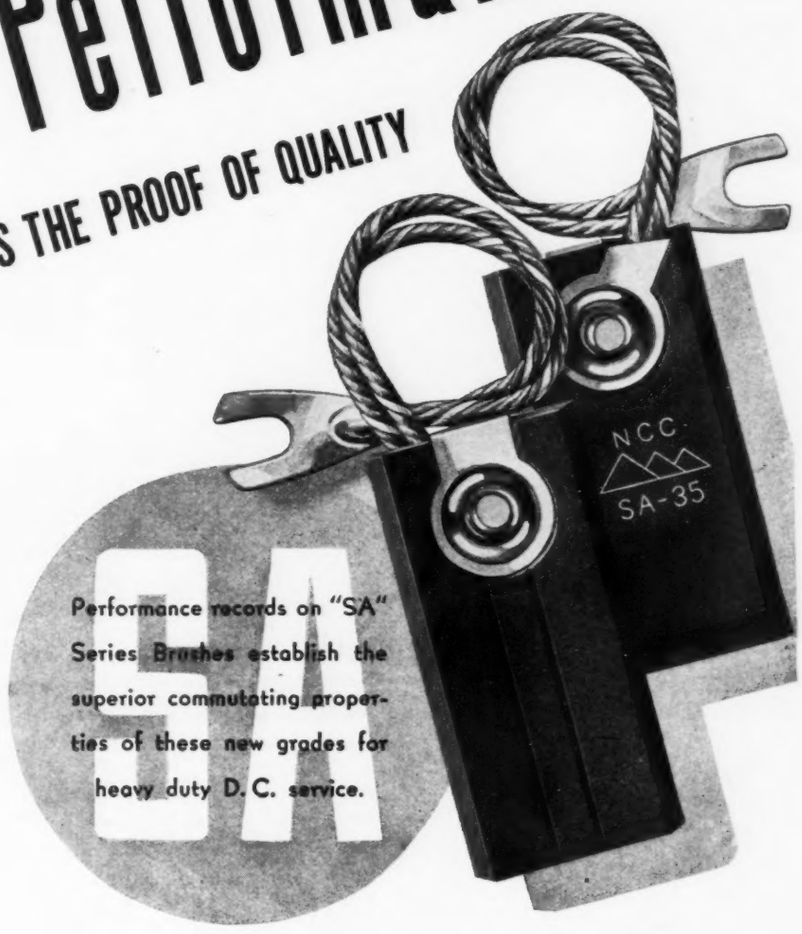


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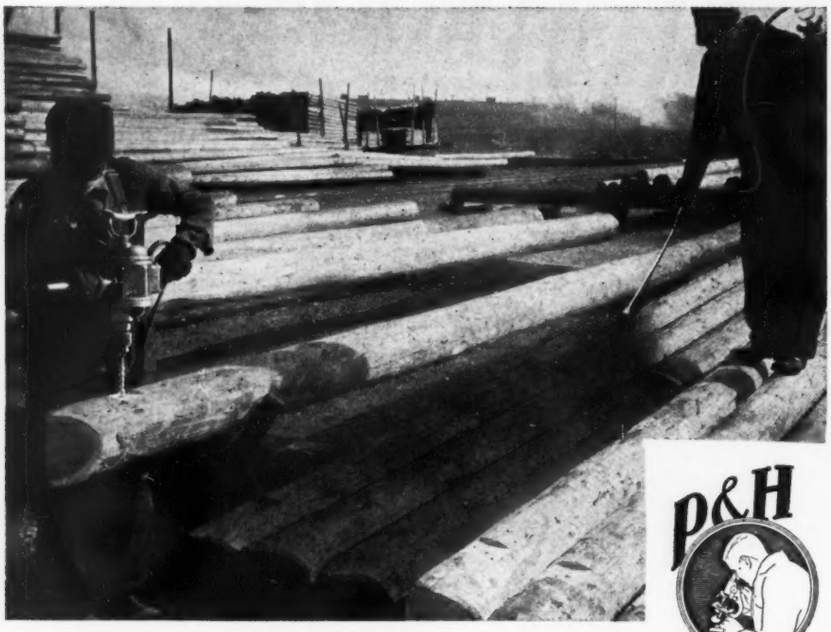

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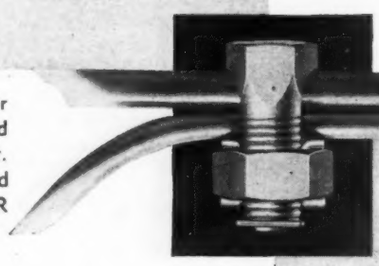

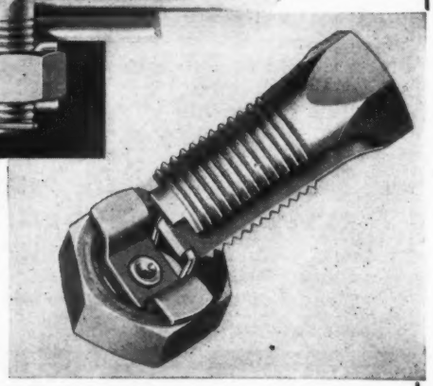

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an initial allotment of $10,000,000 for their project. The agreement binds the district to co-operate with the Platte Valley and Loup River public power districts in the development of P.W.A.'s proposed all-Nebraska power and irrigation system. Under the agreement the Tri-County project will borrow $5,500,000 from P.W.A. and will receive $4,500,000 as a direct grant. As security for its loan the district will sell to the P.W.A. revenue bonds bearing 4 per cent interest, which are payable serially from 1944 to 1977. The Platte Valley Public Power & Irrigation District announced rejection of the proposed P.W.A. agreement requiring co-operation with the two other projects on the ground that there is not enough water for the projects.

CAMDEN, N. J.—Public Service Electric & Gas Company in a brief filed in the state Supreme Court has attacked the validity of the city's referendum for a municipally owned electric light plant. It charged the city was unable to finance construction and the City Commissioners had asked "for a mandatory direction to do an impossible thing." The city voted overwhelmingly November 5 in favor of constructing its own plant. The court, in permitting the referendum, prohibited further proceedings by the city pending review of the commission resolution authorizing the vote. The resolution and referendum were declared by William H. Speer, counsel for Public Service, to be void "because they authorize the taking of the property of the prosecutor, Public Service Electric & Gas Company, for public use without just compensation."

CHATTANOOGA, TENN.—The right of a city council or commission to cancel a utility's franchise originally issued in 1887 is to be tested in a Tennessee Chancery Court as the result of a suit filed by the Chattanooga Electric Power Board in an effort to cancel a franchise held by the Tennessee Electric Power Company. A public referendum last spring authorized the public power board to direct the erection of a municipal power distribution system at Chattanooga, using T.V.A. power. The original franchise was issued to the Hauss Electric Light & Power Company and its successors and assigns and it has been kept up to date through the years.

LEWISBURG, TENN.—In Washington Justice Bailey of the Supreme Court of the District of Columbia has issued a temporary restraining order holding up P.W.A. loans and grants totaling $200,000 for the construction of municipal power plants at Lewisburg and Lenoir City.

PARIS, TENN.—Charging that it is about to be deprived of its $400,000 investment in electric generating and distribution facilities, the Kentucky-Tennessee Light & Power Company has asked the Supreme Court of the District of Columbia for an injunction to restrain the allocation of $179,000 of P.W.A. funds for a loan and grant to the city for the construction of a municipally controlled power plant. The city recently voted six to one in favor of a bond issue to finance the undertaking. City officials expressed willingness to sign a contract with the Tennessee Valley Authority for the purchase of power.

WICHITA FALLS, TEX.—An allotment of $1,750,000 to the city to aid in financing the construction of an electric generating station and distribution system has been announced by Public Works Administrator Harold L. Ickes. The allotment was made from old P.W.A. funds and, therefore, on a basis of a grant not to exceed 30 per cent of the cost of labor and materials employed in the project, but not to exceed in any event $490,000.

## Burnham on Switchgear Grading

[*Continued from page 38*]

electricity, but the determination of this value is an engineering job rather than a purely commercial venture.

"Without reducing the margin of service reliability to the point of danger, switchgear can be built more closely to approximate field requirements if users and manufacturers in certain applications work toward this end. The investment by each will be utilized more efficiently and, most important of all, the use of electricity—upon which the industry is absolutely dependent—will be increased for the benefit of the consumer and those who serve him. The giving of the maximum feasible value per dollar and not the adoption of a policy of mere cheapness of product (in the sense of crude or shoddy material and assemblies) must be the keystone of this program.

"The incentive to save through justifiable economies is a vital one under present conditions."

"Mr. Burnham," I asked, "is not this plan essentially the separating of switchgear into classes? For example, Class A and Class B, in which the price tendency of Class A with the mechanical refinements would be upward and Class B for the lesser important service downward." "Yes," he replied, "but it should not be inferred that the Class B apparatus would have any less margin of safety or service relatively for the service intended than Class A."

"But," I asked of Mr. Burnham, "will it not be considered as a lowering of our present-day standards?" "No," he replied, "we will have a higher standard for the Class A apparatus than today and a standard for Class B with sufficient factor of safety to meet these particular requirements—you don't need a dress suit in which to go fishing."

•

## Sweden Expands Output

Electrical energy production in Sweden during the year ended June 30 amounted to 6,500,000,000 kw.-hr., according to the Swedish Electricity Association. The increase over the preceding twelve months' 5,400,000,000 kw.-hr. exceeds 20 per cent. The greater part of the output comes from water power. In 1935 this type of installation consisted of 2,100,000 hp., whereas in 1907 only 400,000 hp. was developed by hydraulic turbines. In 1935 there was a considerable increase in the use of elec-

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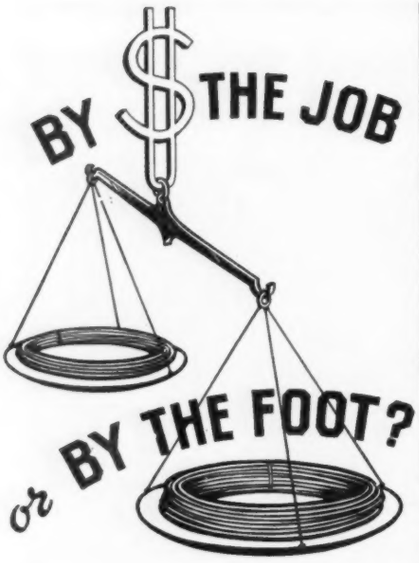


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•

## 1,100,000 Electrical Employees

Electrical manufacturing heads the list of eighteen industries that were undeveloped in 1879 and that gave employment to 1,123,314 workers 50 years later. The average number of wage-earners in these relatively new industries in 1929, according to a compilation by the National Industrial Conference Board, was as follows:

| | |
|---|---|
| Electrical machinery, apparatus and supplies | 328,722 |
| Motor vehicles (not including motorcycles) | 226,116 |
| Motor vehicles, bodies and parts | 221,332 |
| Rubber tires and inner tubes | 83,263 |
| Manufacture of gasoline* | 39,411 |
| Rayon and allied products | 39,106 |
| Manufactured ice | 32,184 |
| Aluminum manufactures | 21,210 |
| Typewriters and parts | 16,945 |
| Refrigerators, mechanical | 16,883 |
| Cash registers and adding and computing machines | 16,840 |
| Oil, cake, and meal, cottonseed | 15,825 |
| Aircraft and parts | 14,710 |
| Phonographs | 14,416 |
| Photographic apparatus and materials | 12,967 |
| Motion picture apparatus (except for projection in theaters) | 10,784 |
| Asbestos products† | 8,092 |
| Fountain pens* | 4,508 |

*Estimated.
†Excluding steam packing and pipe and boiler covering.

In the same half century the average number of wage-earners in all manufacturing industries increased from 4,944 per 100,000 of total population to 7,273 per 100,000 of total population.

The increase in number of wage-earners in manufacturing per 100,000 inhabitants, from 1879 to 1929, was 2,329. Of this increase 924, or 40 per cent, represents employment in new industries which did not exist 50 years ago. The fact that the average number of wage-earners employed by the eighteen new industries listed herewith constituted two-fifths of the increase in industrial employment in proportion to population indicates the magnitude of the contribution of invention and scientific research in opening new avenues of employment and broadening national consuming power.

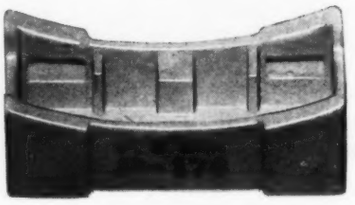
The table does not include service industries that have been developed during the half century, which in the electrical field alone are now giving employment to about 750,000 persons. Census figures are not available for 1929, but for 1932 they were:

| | |
|---|---|
| Central electric light and power | 244,573 |
| Telephone | 320,763 |
| Electric railways | 182,165 |

The combined total for the electrical manufacturing and service industries is 1,076,223. Inclusion of employees of dealers, wholesale and retail, would still further increase this figure.


# THE STAR METER SEAL

## MAKES METERS TAMPERPROOF



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## SALES OPPORTUNITIES IN NEW CONSTRUCTION

ARMOUR, S. D.—Northwestern Public Service Company, Huron, S. D., plans early construction of new steam-operated electric power plant at Armour. Cost about $125,000, of which approximately $100,000 will be used for equipment purchases. Walter J. Dixon, Woelfel Building, Mitchell, S. D., is architect.

LURAY, VA.—Plans new city-owned electric light and power plant, and is making inquiries for different equipment. Town council is interested in securing information on steam and oil engine units, electric generators and auxiliary equipment.

WYNNEWOOD, OKLA.—Closes bids December 13 for equipment for city-owned electric light and power plant. V. V. Long & Company, Colcord Building, Oklahoma City, Okla., are consulting engineers.

DEARBORN, MICH.—Ford Motor Company has plans under way for extensions and improvements in electrical division at power plant, including installation of additional equipment. Cost reported in excess of $150,000. Giffels & Vallet, Inc., Marquette Building, Detroit, Mich., is consulting engineer.

RALEIGH, N. C.—Carolina Power & Light Company plans extensive rural electrification program in 1936, including transmission and distributing lines totaling close to 100 miles in all, with service facilities. Cost over $150,000.

OGDEN, IOWA—Closes bids December 10 for Diesel engine-generating units and complete auxiliary equipment for city-owned electric light and power plant. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

FRANKFORT, KY.—National Distillers Products Corporation, 120 Broadway, New York, N. Y., plans installation of motors and controls, conveyors, electric hoists and other equipment in connection with modernization and expansion program at E. H. Taylor Distillery, Frankfort. Cost about $400,000.

CHATTANOOGA, TENN. — Tennessee Electric Power Company plans extensions in transmission and distributing lines for service in number of communities in vicinity of Columbia, Tenn., including Santa Fe, Hampshire and other districts.

PENSACOLA, FLA.—Hygeia Coca Cola Bottling Company plans installation of motors and controls, conveyors, loaders, etc., in new two-story bottling plant, for which bids are being received on general contract until December 16. Cost about $100,000. Francis P. Smith, Norris Building, Atlanta, Ga., is architect.

CROTON, N. Y.—Contemplates a city-owned hydroelectric power plant, with transmission line to town and distributing system. Cost close to $300,000. Financing will be arranged through Federal aid.

HENRYETTA, OKLA.—Pittsburgh Plate Glass Company, Grant Building, Pittsburgh, Pa., plans installation of motors and controls, conveyors, etc., in connection with expansion at branch plant at Henryetta. Cost about $200,000.

RICHMOND, VA.—Virginia Electric & Power Company has approved plans for proposed new addition to steam-electric generating station on Twelfth Street, previously referred to in these columns, and soon begins superstructure. Award for 12,500-kw. turbo-generator unit and accessories has been let to General Electric Company, Schenectady, N. Y., and for high-pressure boiler and auxiliary equipment to Combus-


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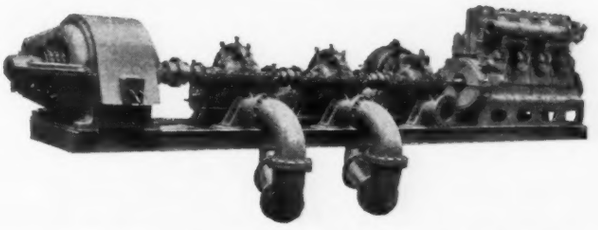

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tion Engineering Company, New York, N. Y. Contracts for miscellaneous equipment will be awarded in near future. Cost about $2,000,000. Stone & Webster Engineering Corporation, Boston, Mass., is consulting engineer.

MITCHELL, NEB.—Roosevelt Rural Public Power District, recently organized, plans transmission and distributing lines for rural electrification, totaling about 360 miles, including power substation and service facilities. Fund of $428,000 has been secured through Federal aid.

SACRAMENTO, CALIF.—Has authorized a bond issue of $130,000 for installation of new police and fire alarm system, and plans to proceed with project at early date.

BREWSTER, N. Y.—New York State Electric & Gas Corporation, Albany, N. Y., sustained a fire loss recently at equipment storage and distributing plant at Brewster, totaling close to $125,000, and plans to replace structure.

WASHINGTON, D. C.—United States Engineer Office, Navy Building, receives bids until January 8, 1936, for electric-operated pumping machinery and other electrical equipment for McMillan pumping station, Washington Aqueduct.

ST. PAUL, NEB.—Howard County Electrification District, recently formed, plans transmission and distributing lines in different parts of Howard County for rural electrification. Cost about $500,000 with service facilities. Financing is being arranged through Federal aid. Henningson Engineering Company, Union State Bank Building, Omaha, Neb., is consulting engineer, in charge.

WARREN, OHIO—Ohio Public Service Company plans installation of new 35,000-kw. turbo-generator unit, high-pressure boilers, stokers and complete auxiliary equipment in connection with new generating station on local site, recently referred to in these columns. Work scheduled to begin early next year. Cost about $2,500,000. G. E. Snider, company engineer, is in charge.

SANTA BARBARA, CALIF. — Toleta Citrus Growers' Association, care of W. W. Ache, 301 North Citrus Avenue, Los Angeles, Calif., architect, plans installation of motors, controls, conveyors and other equipment, including air-conditioning apparatus, in new two-story fruit-packing plant. Cost close to $100,000.

EVELETH, MINN.—Has approved bonds for $621,000 out of total appropriation of $886,000, remainder to be secured through Federal aid, for new city-owned electric light and power plant, and power transmission system, distributing lines, power substation, etc. Proposed to begin work soon. H. D. Sholund is city engineer.

LEXINGTON, KY. — Schenley Distillers Corporation, 20 West Fortieth Street, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new addition to James E. Pepper Distillery, Lexington. Cost about $125,000.

•

## Westinghouse Furnaces Purchased by Ford

The Ford Motor Company has purchased twelve annealing furnaces, together with 36 bases and metal hoods, from the Westinghouse Electric & Manufacturing Company for use in conjunction with its new strip mill. Rated at 230 kw. each furnace will anneal two coils of strip 52 in. outside diameter, 30 in. inside diameter and 48 in. high in each charge. The strip will be used for automobile bodies.